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The
GEOGRAPHICAL JOURNAL

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ARNHEM LAND: EXPLORATIONS AMONG AN UNKNOWN PEOPLE

DONALD F. THOMSON

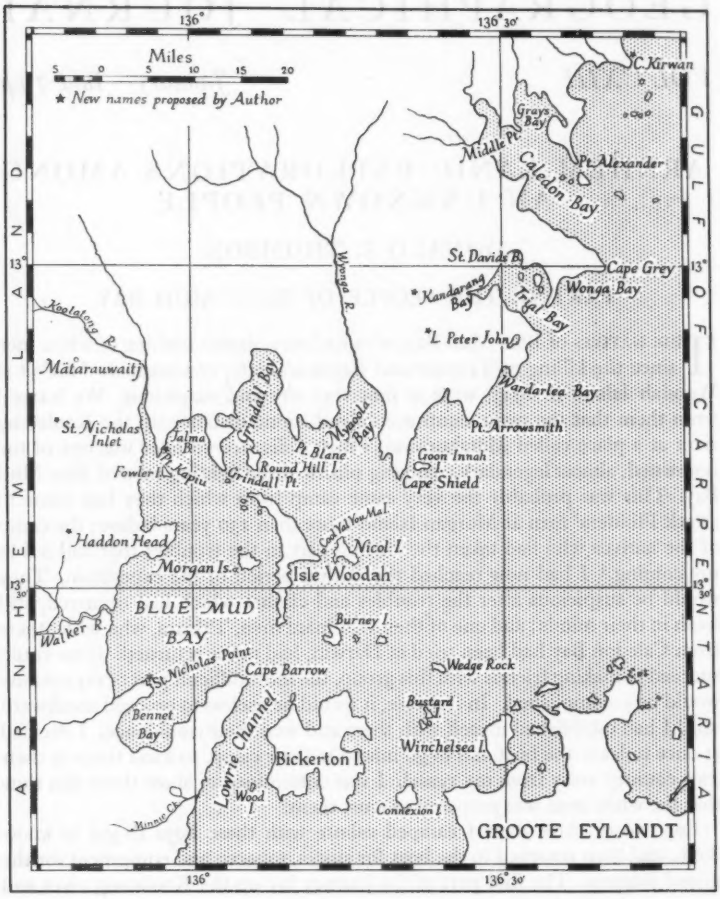
PART II. THE PEOPLE OF BLUE MUD BAY

THE NATIVES of Blue Mud Bay, who had seen almost nothing of white men since the killing of Traynor and Fagan and later of Constable McColl at Woodah Island in 1933, were at first very shy and suspicious. We learned from them that the main camp was inland, some distance up the Koolatong river at a place called Mätarauwaitj, which I discovered later was one of the renowned, almost legendary, camping places of the fighting men of Blue Mud Bay. This was probably the very same camp from which they had come to attack Flinders' men at Morgan Island more than 130 years before; the camp of the natives who had taken the leading part in the troubles that had led to my coming.[1] I had now reached the critical period of the expedition. They would be suspicious after the troubles and clashes which had occurred, still fresh in their minds; and one of their dominant men, Takiara, who with others from Caledon Bay had been tried at Darwin, had never returned. If we could succeed in making friends with this group, the most difficult part of my mission would be accomplished. In any case, it would be useless to proceed northward until I had established myself with them and won their confidence. I decided at once to leave the boat and to go inland to their camp, to meet them in their own country away from my vessel. I was determined to show them this time that the white man was prepared to trust them.

For two or three days I camped ashore with these boys to get to know them, and then returned to the boat for stores, tobacco and equipment for the inland journey. The first part of the journey lay up the Koolatong river and we set out in the dinghy. But the tide was falling and we went aground on the mud banks at the mouth of the river about half a mile off shore. It was about two in the afternoon and we remained stranded for about seventeen hours; for there was only one full tide in this area. The bottom proved to be of a deep

[1] In the first part of Dr. Thomson's paper, which appeared in the last number of this *Journal* (112 (1948) 146–64), he described the incidents that led to his being given a roving commission by the Australian Government to proceed to Arnhem Land, Northern Territory, in 1935 and establish friendly relations with the inhabitants.

soft blue mud. When first we were stranded we jumped out and attempted to push the boat off. But the mud was too soft to give any foothold and we sank up to our thighs and were still sinking, at the same time cutting our feet nastily on sharp shells embedded in the ooze. Two natives from the shore



who were piloting us inland set out to help us. They were evidently experienced at walking over mud and appeared to have a technique of their own for doing it. After a long time they succeeded in reaching us, but in spite of the cold and discomfort of the dinghy they would not attempt to return to the shore. As the mud seemed to have no bottom I did not risk leaving the dinghy. At first we expected to get off on the evening tide and we made ourselves as comfortable as we could. But evening came and the night wore on

and the tide did not come.[1] We did not get off finally until after daybreak on the following morning. That was one of the most uncomfortable nights that I have ever spent. It was bitterly cold and we lay, five of us, shivering on the bottom of the dinghy only eleven feet long. One of the boys who was with me told me afterwards that he had been much afraid that a crocodile (for they are numerous here) might come up in the dark and attack us.

Early the following morning we floated off on the incoming tide and crossed the bar into the Koolatong river. A few miles upstream we picked up "Smiler" and the other natives who were to accompany us and who had been awaiting our coming anxiously all night, and pulled on upstream. Once inside the bar the Koolatong river is deep, and there are more crocodiles in this river than in any other that I have known. We saw many in the river or slipping down the banks, and heard others that morning as we passed. At almost every bend we came upon the broad "slides" by which they enter the water from the high banks on which they sun themselves. At this time of the year, the middle of the dry (south-east) season, they leave the water for long periods to sun themselves on banks sheltered from the keen winds, for the water is cold during the day but relatively warm at night.

The natives had developed a special technique for crossing the crocodile-infested lower reaches of the Koolatong river near the mouth where the banks are fringed with a dense wall of mangroves. When a large party wished to cross without the trouble of bringing a dugout canoe and of making several trips to ferry the party across, they climbed out as far as possible on the overhanging limbs until they looked like flying foxes. Then all dropped or jumped in together, splashing so that they churned the water into foam; making as much noise as they could, they swam quickly across. Even as they swam however the heads of two or three crocodiles could sometimes be seen just above the surface of the water a few hundred yards away.

Some miles up the river we tied up the dinghy and, making a pile of such gear as we could not carry, we set off behind our pilots across the salt pans, which were soft and muddy after the recent heavy rains. The country about Blue Mud Bay was low and flat with extensive areas of flood plains stretching inland from the coast, hidden from the sea by a dense wall of mangroves. We were obliged to travel very slowly. The thick, sticky mud on the salt pans made travel heavy and my feet were still painful after the walk to Bennet Bay. About three miles of this travel brought us to a native camp sunk in a clump of brush on a low knoll close to a lily lagoon. The natives had seen our approach a long way off. As we drew near, the men stood up close to their spears and waited. This was the critical moment. There was no loud exchange of greetings, no shouting, not a word was spoken aloud at first, for

[1] No survey of this area has been made since the voyage of the *Investigator*, but on 16 January 1803 Flinders remarked ('A voyage to Terra Australis,' vol. 2, p. 192), in speaking of North-west Bay at Groote Eylandt which is only a short distance away to the south-east: "Scarcely any run of tide was perceptible in North-west Bay, nor did the rise appear to exceed four or five feet at any part of the island. . . . The irregularity in different places was such, that the time of the high water could not be ascertained; but I think there is only one full tide in the day, and that the flood comes from the northward."

the etiquette to be observed at these times is important, and on one's behaviour the blackfellow is apt to base his permanent attitude.

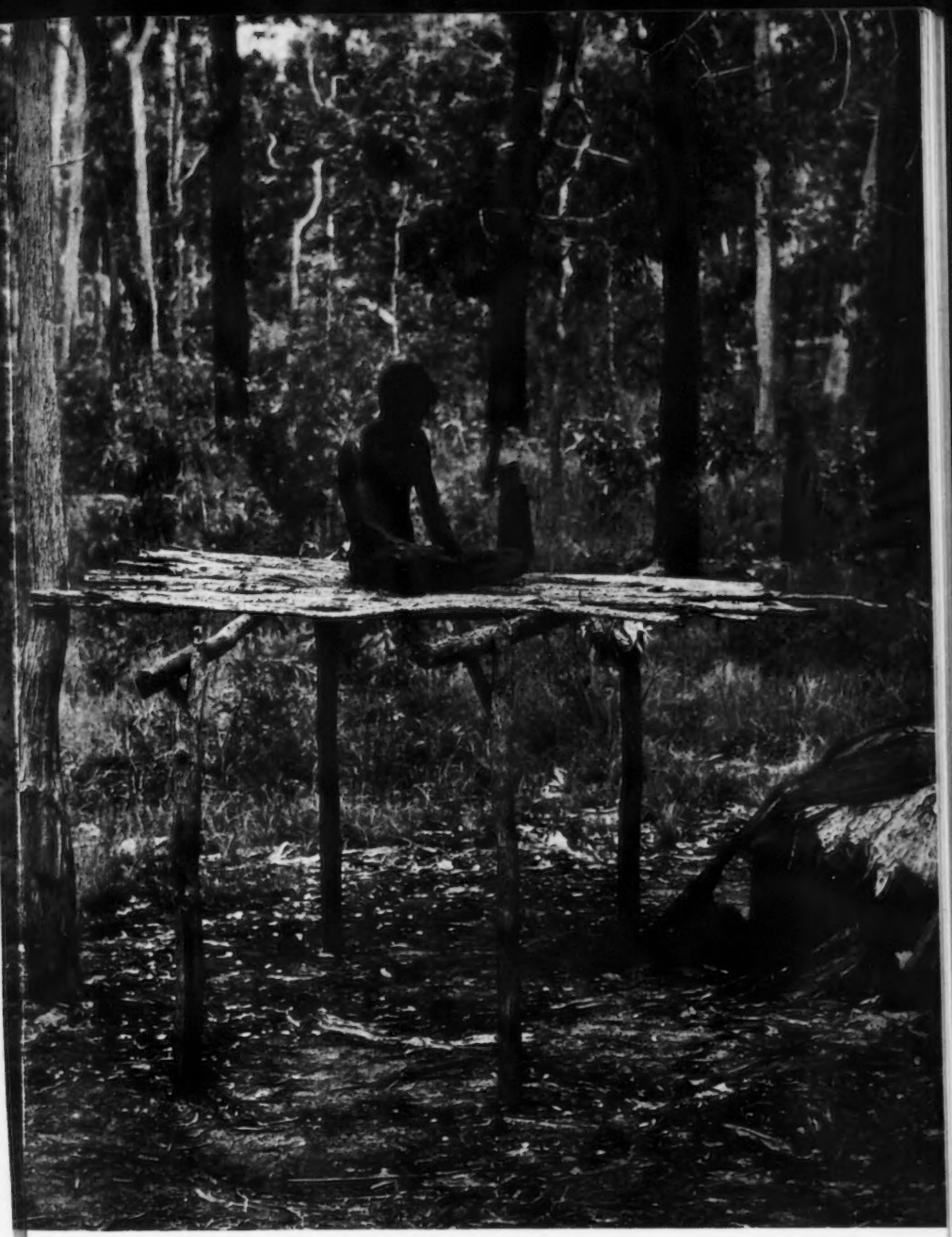
To those accustomed to regarding the Australian natives, because of their primitive culture, as a disorganized rabble, it must come as a surprise to learn that custom, etiquette, good manners and good taste, much as we know it, are nowhere more important. An ill-mannered person, a man who does not know how to behave himself, is regarded contemptuously by these people of Blue Mud Bay as *diku*—"raw," *mornok*—"salt" (sour), or *wakkinngu*—"uncouth." There are many shades of this. A man who offends against good taste exclaims by way of apology "*ta diku ngarra*"—"my mouth is raw" (unripe); but should he inadvertently call the name of a person recently dead before a relative of a certain order or, what is far worse, pronounce the name of a woman before her brother, he exclaims "*ta burrpa ngarra*"—my mouth is foul"—by way of ritual expiation or apology.

We stood up, my boys and I, some twenty yards outside the camp and waited as custom demanded. We had seen from a distance the stir and excitement that our approach had caused in the camp. But now all was quiet. Nobody spoke. To one who did not know the customs of these people in receiving strangers, these dour immobile natives standing in the camp must have seemed ominous. At last two or three of the old men advanced, unarmed, slowly towards us without haste and with a casualness that was too studied, too formal. They knew two or three only of the natives who were with me and these they probably had not seen for many years, but not the least interest, the slightest sign of emotion was betrayed outwardly on either side. A few words were exchanged, casually at first—the important news long ago communicated by gesture or sign language. Then a pipe was lit by my companions and handed round with due ceremony. Sometimes the old men bring out a smouldering log, place it on the ground before the visitor and squat on the opposite side of it. After this ceremonial presentation of fire, the visitor is conducted to the camp, where he takes his place among the single men.

In a few minutes the tension was over, the reserve forgotten, and the natives poured out from the thicket, surrounded us and carried our loads back into their camp. They could see that I had trusted them; that I carried no revolver. One white man alone, on foot, away from the coast and his boat, could not have seemed to them to be very formidable. They received me with the greatest friendliness. Some of them went back to our landing place on the Koolatong river and brought up the remainder of our baggage. I selected a little area of clean ground on the fringe of their camp and had a breakwind of boughs built there to provide some shelter from the keen winds [1] that were blowing across the open plains.

This camp was a very big one for a nomad group at this season of the year, numbering about 200. Normally the natives would have left the wet season camps and have scattered about inland in little groups of two or more families. The place bristled with spears. There were stone-headed spears from a quarry famed throughout Arnhem Land and situated in the hills of the Walker river only a couple of days' journey from this camp; and iron-headed or

[1] During the period that I spent on this coast in 1935, that is from June to December, we suffered from extremes of cold and heat.



Sleeping platform with smoking fire below against mosquitoes

"shovel" spears made chiefly from the water tanks or trepang boilers of wrecked luggers, of which there have been many in this area.[1] Bundles of these spears were hidden, from motives of politeness or discretion, in the bushes surrounding the camp, and neat parcels of paper bark or baskets containing the bones of deceased relations, which they carry for several years, were suspended from trees or forks specially erected for the purpose.

These natives, who speak slightly different dialects of one language, belong to about seven different clans and are referred to collectively by the natives of neighbouring groups as "Dai'i," the name of their language. I shall refer to them therefore throughout this account as the Dai-speaking peoples of Blue Mud Bay.

The night of our arrival, a great dance was held in the camp. The "sing man" was Merara, one of the most renowned fighting men of the coast. These dances or "corroborees" take the form of exquisite little pantomimes, which among these people are generally based on the dance or display of a bird or an animal, formalized or conventionalized. But this night the dance centred around a shallow circular depression scooped out of the ground in which a little fire burned. On the fringe—just inside the shadows—the women danced apart; not the dance of the men but a mincing shuffle from one foot to the other which they employ invariably on these occasions. Towards the end of the dance each of the performers took a leafy branchlet in his hand, warmed it in the fire and beat his head and body all over with the leaves. The women and the onlookers did likewise. Then the leaves were thrown back into the shallow crater in the sand and the dance ceased.

At the time I thought this was just an ordinary corroboree, but afterwards I came to know it for what it was—a ceremony called *mantjarr* held whenever a death occurs or when news of death reaches a group; the leaves warmed in the fire drive away the spirit of the dead which may otherwise haunt his relatives and bring them "bad luck" in hunting. This time it was for the ghost of Takiara. While you yourself may not see the ghost that is following you, it is visible to birds and animals when you are hunting and will bring "bad luck." In the years that followed I was frequently present at, and took part in, these ceremonies and the natives often gave me leaves with which formally to beat myself.

This group was the horde of Takiara, and in this camp I met men like Merara and Djimbarion whose names were known far and wide throughout Arnhem Land for their fighting prowess and for the raids and ambushes they had carried out; men whose names were spoken of with awe and fear in camps as far away as the coast of the Arafura Sea. These men were associated with Takiara in the killing of the white men, Traynor and Fagan, and in the *mêlée* of 1933 in which Constable McColl of the Northern Territory Police was killed at Woodah Island. Here too was the widow of Takiara himself, still waiting for her man who had been taken away on a white man's boat two years before, never to return.

[1] Iron is much valued by these natives since they learned its use from the early Macassar visitors. Matthew Flinders (*op. cit.* vol. 2, p. 206–7) referred to their theft of an axe and a gun from members of his party, and in recent years they have attacked ships to obtain iron fittings and iron from the tanks.

Above, dry-season house of stringy bark
Below, communal type of wet-season house thatched with paperbark

The natives at Mätarauwaitj were living at that season of the year chiefly on water lilies and fish. The grass was beginning to dry off and until the coming of the heavy rains in June (which in this region were quite unseasonable) the natives had been breaking up into smaller groups for the burning of the grass which provides them with much small game. The heavy and unseasonable rains had modified these normal activities, for the grass would not yet burn readily and in consequence the people were still subsisting upon lilies from the big lagoons, with some fish.

Seasonal life and food supply

Climate, and the influence of the seasons on travel and food supply, are the chief factors in the regulation of the nomadic movements of these people. This is well understood by the natives, who in eastern Arnhem Land divide the annual cycle into five or six well-defined periods, each characterized by the climatic conditions which prevail and by appropriate house types and related food supply. The natives also classify the country into "types" or formations as accurately as any ecologist, and they are able to state without hesitation what food supply, animal and vegetable, each association will yield, and what house types they will be occupying in any area at each season of the year. A table showing the six principal seasons as they are recognized in eastern Arnhem Land faces page 8.

During the wet season *kunmul* or *waltjanmirri*, which corresponds approximately to the period from January to March, the country becomes flooded and there is a heavy growth of Blady Grass (*Imperata cylindrica*) which makes travel difficult and uncomfortable. These great Blady Grass flats between the rivers harbour giant venomous snakes such as the dreaded *Obarko*, the "Taipan" (*Oxyuranus scutellatus*)—a very dangerous and aggressive snake which attains a length of more than nine feet. They also provide cover for countless mosquitoes. The people now tend to collect into large camps close to some regular source of food supply which is available at this period, and to lead a more sedentary life. During the wet season, fish and shellfish form an important item of diet but vegetable food, which forms the staple food at most other seasons of the year, is scarce and unpalatable because it is waterlogged and sodden. Some fruits, notably *mundjutj* (*Buchanania muelleri*), are however available, and also *wundan* (*Vitex glabrata*). Each of these fruits provides a good harvest for a short season only, and they also attract emus, which are killed by stalking or by a hunter concealed in the branches of the tree above.

House types of a larger and more permanent nature are constructed during the wet season. These vary according to the locality and the materials available, from the large domed, beehive-shaped houses thatched with tea tree (*Melaleuca*) bark and called *lia damalla* (the head of the eagle), to the mosquito house with sleeping platform called *katauwurdo* under which a fire can be lighted to drive off mosquitoes. In the Cape Stewart district mosquito houses of this type may be constructed on long stilts six or eight feet off the ground, and resemble closely certain primitive house types of Papua. During a lull in the rains, sleeping platforms are built in the open and often used without the bark thatch. Mosquitoes at this season of the year are present

Native of Glyde river district carrying ritual packets of human flesh and dried blood. Right, a woman of Groote Eylandt

Wongo with his warrior sons

in incredible numbers, and often the natives are driven into their houses long before nightfall to seek the protection of fires against the plague of mosquitoes and the small but virulent sandflies.

The long grass and the dense vegetation of the wet season affords cover and protection for the wallabies and other game which have been hunted relentlessly during the dry season. During this brief respite, these animals (which, since they are marsupials and carry their young in their pouches, are very vulnerable) are able to breed.

As soon as the rains cease, the big wet season camps begin to break up and the people disperse to hunt in small units consisting of from one to several families.[1] This is the season of the year, from April to July or August, called *tarra'tarramirri* (see table) when these people are most strongly nomadic. But the first year I spent in Arnhem Land was exceptional. For although it was now the end of June, the people were still living in their wet season camp on the Koolatong river from which they were making restricted excursions over the surrounding country, burning the grass on the higher ground. As soon as the grass begins to dry in a normal season—often as early as April—the people start to burn it systematically in conjunction with organized hunting drives. The grass is not fired at random but in limited areas always held under control. This goes on until late July or even into August, by which time the country is bare and arid-looking with scarcely a blade of grass to be seen. The burning of the grass, although it yields much animal food, has the disadvantage of destroying the vines of food plants and so is carried out with great care until the vegetable harvest is well advanced. The burning grass yields wallabies, bandicoots (*Isoodon*), native cats (*Dasyurus hallucatus*), "goanna"—Monitor Lizards (*Varanus* spp.), and large snakes and their eggs, both Pythons and Rock Pythons (*Liasis*) being taken in numbers. These large snakes are especially relished for their fat and their eggs are also much prized.

A summary of the chief characteristics of each season recognized by the natives of north-eastern Arnhem Land, and the principal occupations and house types, with related food supply, is shown in the seasonal life table. There is nothing artificial about this systematic classification. It is entirely that of the natives themselves and shows a critical, almost scientific appreciation of the environment and its resources. The accuracy with which an Arnhem Land hunter could name a given association according to its botanical composition, and the food supply, woods for spears and other purposes, as well as resins and fibre plants that it would yield at any season of the year, was astonishing. It showed that these natives are far from the shiftless and improvident people of popular report.

Segregation of women

The women at this camp were particularly shy, and at first they either ran away as I approached or hid themselves. There is no doubt that in the past the natives on this coast have suffered through the pursuit of their women. As the men are numerically strong and are independent and warlike in

[1] The family is the important unit of social life and lives as an independent group within the horde. A family consists of a man and his wife or wives and their young children, for these people are polygamous.

disposition, this interference has not unnaturally met with resentment and even resistance—the true facts of which have been suppressed by the real aggressors. It must be borne in mind when dealing with these people that they have had long intercourse with strangers, as Matthew Flinders observed, and that long before the occupation of their country by white men they had been accustomed to defend their women from predatory voyagers. That they did successfully defend their rights, and that these rights were recognized and respected by the Macassars who visited Arnhem Land each year, is indicated both by the absence of any strong Malay influence on the physical characteristics of the people and by the fact that the Macassars were able to visit this coast annually and to work amicably with the natives in a region which for decades after the coming of the white man was regarded as the most dangerous on the entire coast of Australia.

On the occasion of my next visit, however, I was able without any trouble to make friends with the women of this Blue Mud Bay group sufficiently to approach them, and to make a study and film record of their food gathering practices and domestic economy.

(*To be continued*)

Season	*Corresponding calendar months*	
1. Mir'dawärr	Late March and April	End of wet se but air still hot a Grass long and Fish very num "Rain finish;
2. Tärra'tärramirri ..	Late April, May, June, July, August	South-east or "Cold weather Grass drying ning of grass-bu *Kardaikamirri*
3. Rärändärr	September and October	Hot dry season *lungurma* (north- *Kardaikamirri*
4. Worlmamirri ("with thunder") or Ḏala Mai'ya ("north or north-east wind")	Late October, November, December	*Ḏorro waltjan* bringing thunde "Thunder sing Period of maxi terized by violen Average temp thunder-storms each characterize relative length w from the north-e
5. Baramirri ("with north-west wind")	Late December and January	Short season w *mundjutjmirri* fro Vegetable food Two kinds of *kurkamirri* (male first term applies breezes from the
6. Kunmul or Waltjanmirri ("with rain")	January, February, March	*Kunmul* is the the first, *gurritja* by a subtle disti Second phase but no *ŋata* (veg

Characteristics of season	*House*
vet season with scattered showers. Wind in south-east (*dimoru*) quarter hot and humid. g and rank. Vegetable foods becoming plentiful. numerous. ish; him flower everything; grass long, him fall down."	Houses chiefly against mosquit (mosquito platfo use.
st or dry season. Wind in east and south-east blowing almost incessantly. eather time" (May to July), minimum average temperature 25·2° C. ving off. Leaves of yams and other plants starting to dry and fall. Begin- ss-burning season. Harvest of vegetable foods abundant and mature. *mirri tayarra:* the stringy bark, *Kardaika*, is in flower.	Permanent ho used except in im places where wa Breakwinds chief cept in cold weat circular houses *durde djerrikitj* ro leuca bark are bu
season. Hot periods towards close of dry (south-east) season. Wind chiefly north-east), lightning frequent and first thunder is heard. *mirri* (*kardaika* flower) or *mundjutj* flower.	Camps chiefly in only; bark house open type, such a (two openings) in camps.
altjan, literally "the nose of the wet season," or *worlmamirri*—with or under—late October. r sing out—proper hot time" (*worlma murriyuna*, thunder rumbles). maximum heat and humidity immediately before the rainy season, charac- violent thunder-storms of increasing frequency. temperature 29·9° C.; wet bulb average over 21·2° C. Characterized by rms which herald the wet season. Followed by two brief transition periods, terized by distinctive winds. These periods may overlap and may vary in gth with the seasons. The transition period called *yala mai'ya* is named rth-east wind and precedes the onset of the north-west or *bara*.	See above. A few wet seaso begin to make t with onset of first
son with wind in north-west that marks the breaking of the wet. Called also *ri* from the fruit *mundjutj*. e foods such as yams in full leaf. ds of *bara* or north-west wind are recognized: (i) *Bara yindi*, the big or (male) *bara*; (ii) *Bara nymokunin*, the small or *toikun* (female) *bara*. The pplies to the more boisterous north-west gales, the second to the gentler n the north-west.	Wet season ho types; often of (*Eucalyptus tetrod* tea tree (*Melale* large communal h *dämälla* (the head
s the wet season proper. The natives regard it as divisible into two phases: *rritjarra*, is again subdivided into three, each believed to be characterized distinction in winds. hase of the wet—the period of torrential rains, *yindi waltjan* (the big rain) (vegetable food) *yata baiyon—kauk'kauk.*	See above.

SEASONAL CYCLE IN ARNHEM LAND

House types	*Seasonal activities*
Houses chiefly for protection against mosquitoes. *Katauwurdo* (mosquito platforms) in frequent use.	Natives generally sedentary and living in big camps. Extensive nomadic moven restricted by flood waters, long rank grass and mosquitoes. In former times departure of Macassar fleets with strong east and south-east w on return to Timor Laut and Celebes. Organized goose-hunting expeditions of Djinba and other groups into swa Fishing, especially large-scale communal fishing operations and drives, carrie where flood waters are receding; including basket traps set in weirs, nets, an *gorl* in use only in valley of Glyde river.
Permanent house types little used except in important camping places where water is abundant. Breakwinds chiefly employed except in cold weather, when semi-circular houses of type called *durde djerrikitj* roofed with Melaleuca bark are built.	Natives nomadic; big wet-season camps breaking up into nomadic groups. Systematic burning of all extensive grassed areas begins at this season in junction with organized communal drives for kangaroo, bandicoots, "goa (*Varanus*), etc. Burning is also carried out to make travel easier and for prote from mosquitoes and venomous snakes. Fishing continues to be important, and nets, "grass barriers," in shallow wate plains and salt pans, and other specialized methods, still practised. Hunting kangaroo and other bush game continues extensively in conjunction burning of grass. N.B. The period from August to November (inclusive) when *yatu* is abu constitutes the most important period for ceremonial activities.
Camps chiefly in open, for shade only; bark houses (when used) of open type, such as *turrara marma* (two openings) in semi-permanent camps.	Nomadic activities becoming less after burning of grass, with intense hea increasing scarcity of surface water making travel hard. Poisoning of fish carried out in waters now concentrated by evaporation. Spe of fish continues in estuarine and coastal waters. Important period in ceremonial life.
See above. A few wet season types of house begin to make their appearance with onset of first rains.	Nomadic movements much restricted. Natives generally concentrating in cam permanent water.
Wet season houses of several types; often of stringy bark (*Eucalyptus tetrodonta*) sheets and tea tree (*Melaleuca*); especially large communal houses called *lia dämälla* (the head of the eagle).	In former times Macassar fleets arriving with the onset of the north-west (*bara*) and dispersing to sites occupied regularly for trepang fishing. Natives concentrated in wet season camps leading almost sedentary life. travel restricted by flood waters and by dense growth of rank grass.
See above.	See above.

Food supplies

Fish and shell fish abundant.

Vegetable foods including yams (*Dioscorea transversa* and *D. sativa* var.) which will be fully mature in *tarra'tarra*, becoming abundant.

Magpie geese and their eggs abundant.

Vegetable food harvest abundant and varied and now fully mature.

Water lilies, *dirrpo* (*Nymphaea* spp.), important and collected in great quantities.

Turtle eggs collected on coast. Fish still abundant.

From August until March, *ŋatu* (fruit of *Cycas media*) becomes the most important single item of vegetable diet and also the staple food throughout the greater part of Arnhem Land.

Ɗatu staple article of diet in most areas.

Fish, tortoises and water snakes such as Macleay's Water Snake (*Hypsirhina*), the Javan File Snake (*Acrochordus*).

Mundukul (*Liasis olivaceus*) taken in large quantities by natives swimming in inland (fresh) water.

Corms of the Mat Rush (*Heleochatis sphacelata*) important in many coastal districts, and may form the staple food for some months until wet season begins.

Ɗatu still abundant and forms chief staple article of diet until March.

Numerous species of fruits such as *Wundan* (*Vitex glabrata*) and wild berries, particularly the sweet white fruits of *Flueggea microcarpa*, obtained at this season in very large quantities.

Ɗatu harvest finished.

Important vegetable foods of *baramirri* are the fruit *narrani* (*Eugenia suborbicularis*), *dängi*, *tänkäppa*, *mundjutj* or *wundan*.

Many native fruits, most of which occur only for brief seasons, eaten in large quantities. But during the height of the wet, from January to early March, vegetable foods are almost entirely lacking, being *kauk'kauk* (soggy or watery) and unpalatable.

See above.

[Note: *Ɗ*, *ŋ* represents the sound *ng* as in English *sing*.]

THE FINNISH OUTLOOK, EAST AND WEST

W. R. MEAD

THE RECURRING TRAGEDY of Finland is that of a marchland state subject to the dual control of Eastern and Western Europe. It lies between the Russian circle of strategic control and the Atlantic circle of economic control. As a political unit it is dependent on Russian policy; though it is separated from the U.S.S.R. by one of the most effective natural barriers in Europe. As an economic unit it is oriented to Western markets and linked to them by established maritime relations which defy increasingly the restraint of the winter freeze. Finland shows one face to the east, another to the west. It balances an eastern frontier of conflict and a western frontier of contact. In spite of this, perhaps because of it, Finland retains an individuality stronger than that of any other eastern marchland state. Its political shape and economic form have been substantially altered by the Moscow settlement of September 1944. It is proposed to analyse these changes separately and to assess the possibilities of reconciling the eastern and western outlook.

The political approach

To the political identity as well as to the economic independence of Finland, the forest has made a primary contribution. In association with lake and marsh, it has provided this low-lying country with an eastern barrier in some ways more effective than a mountain range. "La forêt est la vraie frontière," wrote Jacques Ancel in the mid 'thirties, ". . . La Finlande, en dépit de la platitude du sol, a gardé son originalité par la protection de sa forêt." [1] The defensive rôle of the forest is noted in books on campaigning from 1809 to 1939. It is elucidated in the pages devoted to Finland by J. H. Marshall-Cornwall.[2] There is scarcely a frontier in Europe more "geographically demilitarized" than the eastern borderland of Finland.

The Baltic Shield meets mainland Eurasia in the three isthmuses which separate the Gulf of Finland, Lake Ladoga, Lake Onega and the White Sea. Finnokarelia is one physiographic region embracing the White Sea slope as well as the Baltic slope. The East Karelians, who originally inhabited the White Sea slope, are a Finnish people. Through these forest people the Finns merged with the peoples of Muscovy along the isthmian line. Finland as shaped in historical time has not therefore been the real borderland between Russia and Western Europe. The zone of transition has been to the east of the 1939 boundary. For this reason, Finland tended to be the most "racially" homogeneous of the Middle Tier of European states. Undue emphasis may have been given by Finnish chauvinists to the ethnographic relationship of the East Karelians; but in fact the relationship was indisputable.

From 1918 until silenced in the early 'twenties, the East Karelians strove

[1] J. Ancel, 'Géopolitique,' p. 70, Paris, 1936.

[2] J. H. Marshall-Cornwall, 'Geographic disarmament: a study of regional demilitarization,' London, 1935.

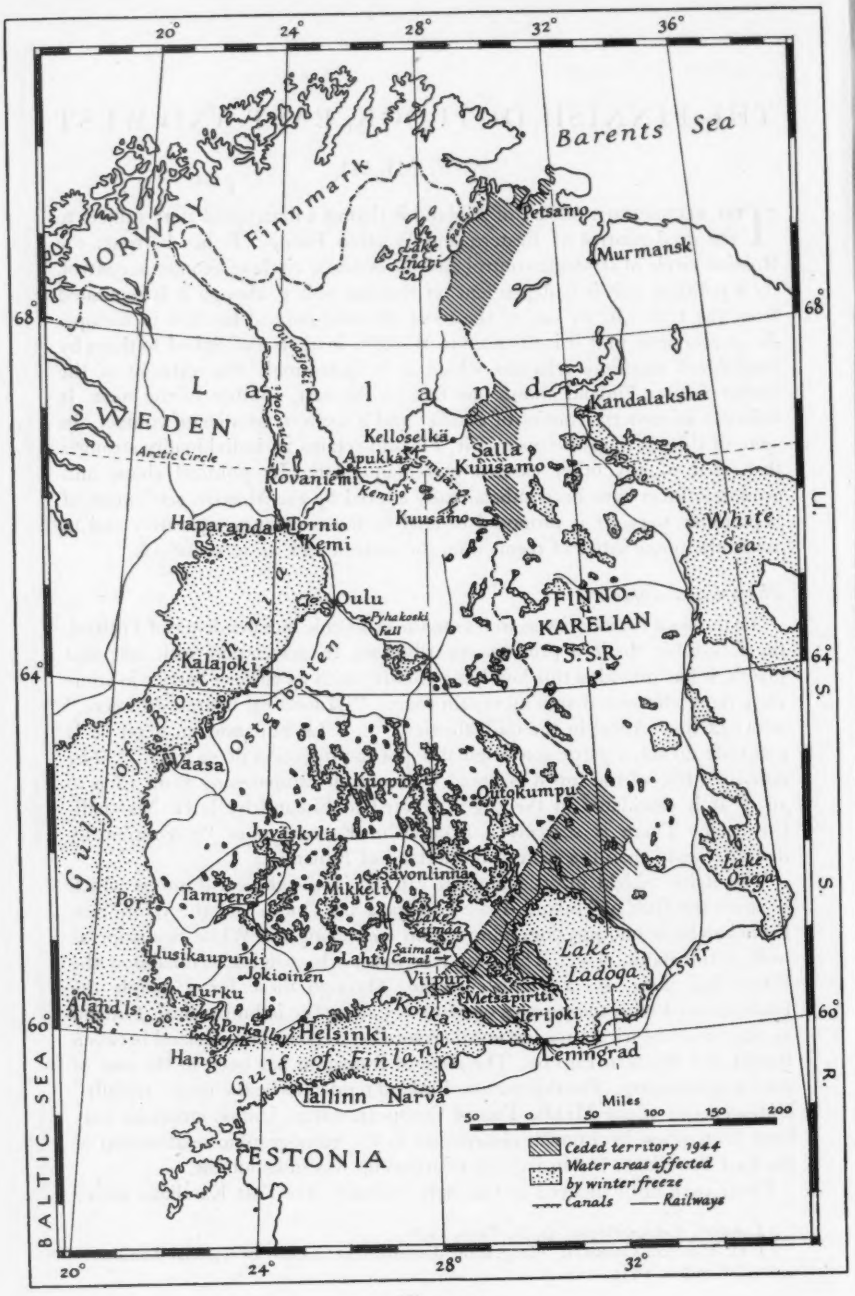

20°
24°
28°
32°
36°
68°
64°
60°
Barents Sea
NORWAY
Finnmark
Petsamo
Murmansk
Lake Inari
L a p l a n d
SWEDEN
Arctic Circle
Kandalaksha
Kelloselkä
Apukka
Salla
Kuusamo
Rovaniemi
Kemijoki
Haparanda
Tornio
Kemi
Kuusamo
White Sea
U. S. S. R.
Oulu
Pyhakoski Fall
FINNO-KARELIAN S.S.R.
Kalajoki
Gulf of Bothnia
Österbotten
Vaasa
Kuopio
Outokumpu
Jyväskylä
Savonlinna
Lake Onega
Mikkeli
Tampere
Lake Saimaa
Saimaa Canal
Lake Ladoga
Uusikaupunki
Lahti
Jokioinen
Viipuri
Svir
Turku
Ålands Is.
Kotka
Metsäpirtti
Terijoki
Porkkala
Helsinki
Leningrad
Hangö
Gulf of Finland
Tallinn
Narva
BALTIC SEA
ESTONIA
Miles
50 0 50 100 150 200
Ceded territory 1944
Water areas affected by winter freeze
Canals
Railways

Figure 1

for independent statehood or alternatively for union with their western kinsfolk in a Greater Finland. A petition was presented at Versailles and again to the League of Nations without effect. Their cause was kept alive in Finland. The Finns have a messianic streak, which thus expressed itself in a nineteenth-century school book: "God has predestined the Finnish people to be for a model and a teacher of many poor races related to them." It was with lively anticipation that the Finns pressed beyond the boundary of liberated Karelia into East Karelia in their three-year war (1941–44). Their reception was disappointing. Occupation of the most densely peopled part of the Finnish–Karelian S.S.R. (to the line of the river Svir) proved that there had been almost complete "russification" of Finnish stock.[1] The population had blended with Russian peoples who in twenty-five years had assumed a majority position. Improved communications, above all the strengthened Murmansk railway, had reduced isolation. East Karelia (Itä Karjala) existed on ethnographic maps compiled in Finland, employing exclusively Finnish nomenclature from Äänisjärvi (Lake Onega) to Kantalahti (Kandalaksha). By 1940 however the significance of such maps was primarily historical.

Only in the south-westernmost of the three isthmuses were Finland and Russia in direct touch. To Finns, the word "frontier" is synonymous with the Karelian isthmus. The pre-war boundary from Ladoga to Petsamo—as long as a line drawn from Narva on the Gulf of Finland to Odessa on the Black Sea—meant less to them than the eighty kilometres of isthmus pinched between Terijoki and Metsäpirtti. With geological, "racial," linguistic, orthographic and religious boundaries in close juxtaposition here, it would be difficult to find a more precise frontier zone in all Europe.

The Peace Settlement of 19 September 1944 detached the bulk of Finnish Karelia from Finland. It was the most significant of the four territorial losses.[2] The others were Salla–Kuusamo (7,500 sq. km.) at the waist of Finland; the Petsamo corridor (10,000 sq. km.) in the extreme north, and the Porkalla peninsula (380 sq. km.). The last of these, commanding the approaches to Helsinki, was leased for fifty years. It has been described by Baltic strategists as a comparable base for Finland to the Isle of Wight for England or Sandy Hook for the U.S.A.

The present eastern boundary of Finland approximates to that drawn by the Treaty of Uusikaupunki in 1721. There is however a difference. In 1721 population as well as territory was annexed. Karelia remained a part of Finland in Russia. In 1944 territory alone was annexed. There was an exodus of nearly all the Karelian population. This implies two things. First, the possibility of irredentism developing in the ceded area has been excluded. Secondly, there is now a buffer area, presumably populated by immigrant Soviet citizens, between Finland proper and the ethnographically related peoples of Karelia. Viipuri (Viborg)—fortress, bishopric, second city and

[1] A diary account of this is given by Olavi Paavolainen, 'Finlandia i Moll,' Helsinki, 1947.

[2] H.M.S.O. Treaty Series No. 53 (1948). The appended map to this British publication uses exclusively Russian characters. The map in the present paper uses Finnish forms of place names in the ceded territories. The most important of these are Viipuri (Vyborg in Russian) and Petsamo (Pechenga).

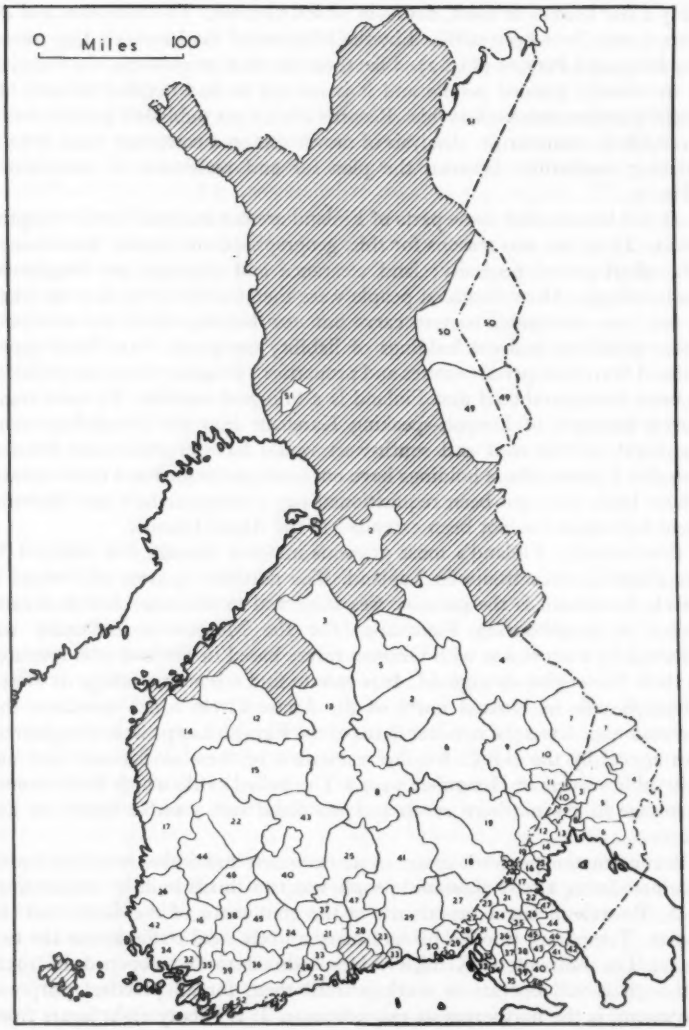


Fig. 2. Evacuation and reception areas (with corresponding numbers) for people displaced from ceded territories. Shaded areas are excluded from programme

of the frontier on the Tornio estuary. Their citizens have free access across the frontier. Since 1935 the migrant Lapps have also been supplied with special inter-Scandinavian frontier passes.

While reconstructing its economy within contracted frontiers and upon depleted resources, Finland has had to meet a heavy reparations schedule.

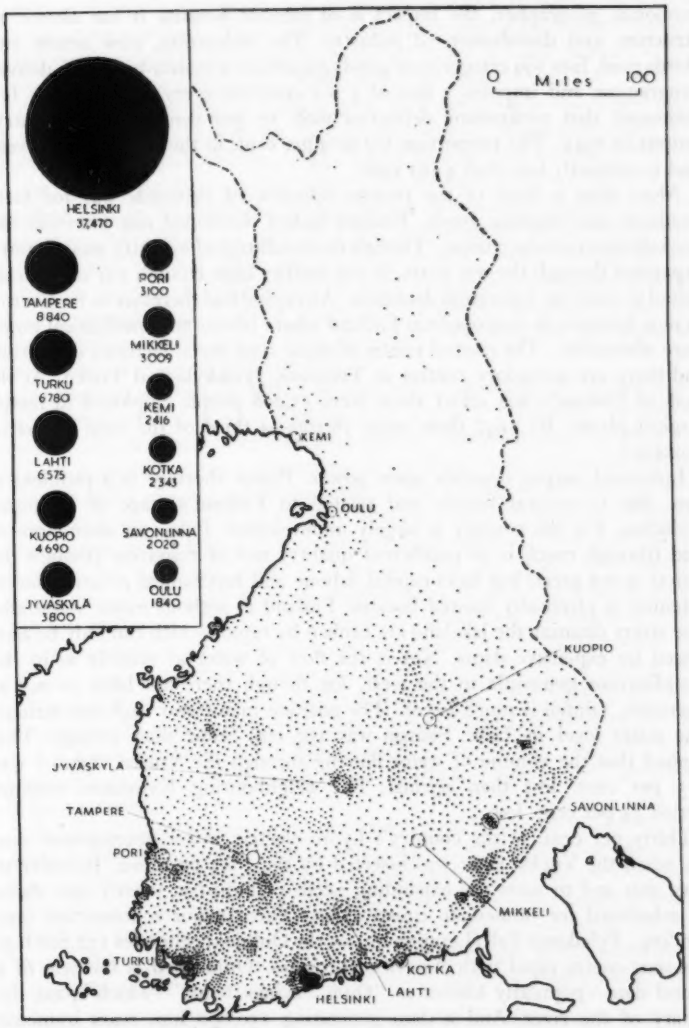


Fig. 3. Resettlement of displaced people, 1947. Each dot represents 100 people received, on a basis of rural communes. Circles represent numbers received by towns

Under Article 11 of the armistice of 19 September 1944 Finland must pay to the U.S.S.R. the equivalent of $300 millions in commodities at 1938 prices. As amended on 1 July 1948 the agreement extends the period of payment from six to eight years and somewhat reduces the total. For the

economic geographer, the impact is of interest because it has altered the structure and distribution of industry. The indemnity, now nearly two-thirds paid, lists 199 categories of goods payable in a month-to-month delivery programme and imposes a fine of 5 per cent. for every late delivery. It is estimated that reparations deliveries took 17 per cent. of the country's output in 1945. The proportion fell to 9 per cent. in the two following years and is currently less than 4 per cent.

More than a third of the precise schedule of demands was for metal products and machine goods. Finland lacked developed raw materials and workshops to produce these. Though its metallurgical industry was of course expanded through the war years, it was neither large enough nor structurally suited to meet the reparation demands. All capital had therefore to be diverted to new factories in metropolitan Finland where labour and mechanical power were obtainable. The control centre of these state metal factories is Helsinki and there are secondary centres at Tampere, Jyväskylä and Turku. At the peak of Finland's war effort there were 55,268 people employed in metallurgical plants. By 1947 there were 78,106—a third of the total industrial workers.[1]

Industrial output depends upon power. Power shortage is a problem at once due to natural factors and related to Finland's stage of economic evolution. For the country is largely undeveloped. It has an abundance of land (though much is of indifferent quality) and of resources (though the variety is not great) but lacks capital, labour and mechanical power. Power-potential is physically limited because Finland is without major waterfalls. The rivers draining the lakeland are broken by rapids which can only be harnessed by expensive dams. Nor is the flow of water as reliable as in the Scandinavian peninsula to the west, for though there are lakes to act as reservoirs, rainfall is much lower. The position in autumn 1948 was serious. The water level in Lake Saimaa was 100 cm. lower than average. This implied that the volume of water flowing through the Vuoksi channel was 55·5 per cent. less than normal. The neighbouring Kymmene channel carried 54 per cent. less.

Thirty per cent. of the country's hydro-electric power development was lost when the Vuoksi river was bisected by the 1944 partition. In order to offset this and to meet the expanding needs of industry, twenty new dams are scheduled for immediate construction. Three major schemes are outstanding. Pyhakoski Fall (Leppiniemi) on the Oulujoki generates 132,000 h.p. at a sixty-metre rapid with American turbines. Oulu itself is the seat of a second dam—popularly known as "Oulu Savings Bank"—which spans the estuary of the river. And a dam generating 150,000 h.p. rears immense levées on either side of the Kemi estuary. Such developments can compensate for but never replace the Vuoksi plants which formerly served the domestic and industrial needs of the more populous and advanced south-west.

Finland has neither coal beds nor oil deposits. Before the war it imported a steady two million tons of coal and coke annually, principally from Great Britain and Poland. Coal imports have now been severely cut. The remainder is devoted to essential industry such as metallurgy or to vital consumer needs

[1] "Finlands metallindustriförening," *Årsberätt. för År*, 1947, Helsinki, 1948.

including domestic gas. (It is not often realized that Helsinki's homes are dependent on coal gas.) When fuel rationing returned in September 1948, the daily press advertised that one centimetre of water in Lake Saimaa was the equivalent of a ship's cargo of 3500 short tons of coal.

Timber is the first line of fuel reserve. It is essential to the inland forest factories far from coal imports, and to the railways which carry their products to the export harbours. These forest factories are strikingly uniform in size, employing an average of 1000–1500 workers, of whom about a third are dismissed in late October when harbour or lakeside logging ends. Log sorting is a formidable task, for every log is marked by the company owner and in South Finland there may be forty to sixty owners using the same waterway. Behind such factories with their waterside organization are three to six thousand forest workers. Most of their activity is based on the steam power provided by the less valuable birch, the waste from the saw mills, and, if necessary, by pine and spruce logs.

Shortage of mechanical power is matched by shortage of human labour. This seems paradoxical in a country with a steady population increase and a family life of almost Victorian abundance.[1] Moreover, child mortality has fallen remarkably where a century ago every third child died in its first year. There is still a measure of child neglect which springs from shortage of man power and the tradition of country women working the soil. "Woman is first and foremost a labourer: the mother's duties follow," observed Zacharias Topelius the historian, writer of romances and one of the first university geographers in Finland.[2] Personal observations and statistical analyses confirm that this is still so. Thus N. Westermarck, examining the working days of 960 housewives in Osterbotten, found the time devoted to farm work to be nearly a quarter as great again as that given to housework.[3] A survey of 467 country households made by Elli Saurio shows that farm work almost everywhere takes precedence on farms of less than 25 hectares of cultivated land.[4] Intensive inquiry by Martti Sipilä revealed that women do more than half the farm work on all farms in south Finland with less than 19 hectares of cultivated land.[5]

Farm labour difficulties have been exaggerated by two facts. First, the war made terrible inroads upon active young male labour. More than 70,000 men lost their lives in the two Finnish wars and another 50,000 are war invalids. Secondly, the labour pool has been disturbed by the high wages of industry. The rural population does not show a marked absolute decline; but it does show a substantial relative decline. It is losing people to the factories. This movement to the towns is additional to the mobility which Finnish labour

[1] An acquaintance in the Finnish Land Survey Office casually mentioned fifty-three first cousins. It prompted me to wonder what might have been Peter Kalm's reaction. He was very impressed by the fertility of the seaboard Americans in the mid-eighteenth century; but made no reference to the population features of Swedish Finland where he was such a live element in the later years of the eighteenth century.

[2] Z. Topelius, 'En resa genom Finland,' p. 33, Helsinki, 1874.

[3] N. Westermarck, 'Svenska Österbottens Jordbruk och Befolknings förhållanden i Socialekonomisk Belysning,' pp. 220 *et seq.*, Tavastehus, 1945.

[4] E. Saurio, 'Maalaisemännän Ajankäyttö,' p. 173, Helsinki, 1947.

[5] M. Sipilä, 'Maatalouden Työajankäyttö ja Työntutkimus,' Helsinki, 1946.

has always shown. The small farmer normally supplements his income by taking seasonal employment in lumbering or snow clearing or part-time work like tractor driving. Such movement is socially and economically healthy, in contrast with the mobility of industrial labour. An instance of this is a typical paper and pulp mill near Kemi which, in 1946, registered 3571 new workers and struck 3239 from its employment roll.

The stability of the rural population and the place of agriculture in the national economy account for the rapid return to a reasonable standard of living from the first famine year of peace. It is less than a century since Finland suffered recurring famine. Any disturbance in the free movement of international trade is always likely to reduce the country to its formerly precarious position. Finland is still not self-sufficient in bread grains and the relative importance attached to animal husbandry has prevented the expansion of grain lands. An analysis of the statistics for the years 1941–44 shows that 200,000 metric tons of bread grains (rye and wheat) were imported annually. These imports represented 50 per cent. of the domestic harvest—and in peace time they were sometimes higher.

More striking than the size of these imports is the increase in domestic production. Boundaries of cultivation have been extended to a limited degree by piecemeal reclamation of forest and marsh between the two wars. But much more significant has been the transformation in the distribution of grain growing through the work of the seed-breeding stations at Jokioinen and Tammisto. In the summer of 1948 the farm research station at Apukka, 10 kilometres north of the Arctic Circle, had excellent stands of spring wheat. It is perhaps more important that private holdings near at hand had the same. Breeding carried on in collaboration with the Swedish institutes has achieved miracles which would have pleased the King of Brobdingnag. Professor Pesola calculates that there has been an increased return of more than 100 million kilograms annually in the generation of Finland's independence due to breeding alone.[1] Canadian and Russian strains have also been crossed with native varieties. The principal objects of breeding are winter hardiness, rust resistance, quick-ripening and heavy yields. With these ends in view, fascinating experiments are now being made with crosses of rye and wheat. Rye-wheat may well effect a revolution in the pattern of Finnish grain growing in the next generation.

Because harvesting is always risky on the frontiers of cultivation, grassland farming is better favoured. The most noticeable changes in the farm landscape are the extension of ley farming and the multiplication of silos. The "A. I. V." method of ensilage has caught the imagination of the farmers.[2] Not only does it provide an alternate cattle food to meadow hay, but its advocates claim that it can supplant imported fodder concentrates on which pre-war Finland was dependent.

The traditional policy of the government has been to build up stocks of

[1] V. A. Pesola, "Kasvinjalostuksen vaikutus maamme kasvinviljelystuotannon nousuun valtiollisen itsenäisyytemme aikana," *Maataloust. Aikakausk.*, Helsinki, 1940, pp. 43–68.

[2] A. I. Virtanen, 'A. I. V. systemet,' Helsinki, 1945. An English translation of this important book is planned for the immediate future.

grain in preparation for the lean years. Since the war, these have been purchased chiefly from the U.S.S.R. (250,000 tons in 1948) and have been the main feature of the restored eastern trade. There is a long historical precedent for this grain trade. Medieval Danzig, chief port for East European grains, provisioned Turku's breakfast table. In 1913 Finland's principal import from both Germany and Russia was grain. Stettin, linked by rail with Russian grain lands, was the chief port of supply.

The bases of reconciliation

Finland has to reconcile itself to its transitional position in Middle Europe. Because it adheres to the democratic traditions of the west, the development of contacts with the east is not easy. The strengthening of trade relations over the eastern border would seem to be a positive step forward. Trade with Russia, however, has so far been marked by restraint. Throughout the last century Finland's nominal independence as a political unit meant exclusion from the great trading area of the Czarist empire in which the bulk of the future Succession States then shared. Only after the trade agreement of 1859 and before the restoration of Russian protection in the 1880's was there relative freedom of exchange and of population interchange. Stronger commercial relations followed the outbreak of the 1914–18 war and the interruption of Baltic shipping. Finland became a minor industrial antechamber and transit area for Russia. Cotton, some of it carried by sledge from Norwegian ports in the High North, and metal products were the chief requirements; employment in the metal industry rose from 15,969 in 1912 to 27,066 in 1917. Russia's share of Finland's total trade rose to the 60 per cent. level which it had touched sixty years earlier. After the Revolution and Finland's declaration of independence, it fell to about 3 per cent. in the nineteen-twenties. The balance was favourable for Finland. Independent Finland, therefore, grew up almost without commercial contact with the U.S.S.R. It even experienced commercial antagonism due to Russia's policy of dumping forest products. The whole Finnish economy was oriented to the west which was called in to redress the balance with the east.

Economic cooperation over the eastern border, however, depends upon Russian policy. And this is incalculable. Forty years ago, General Borodkin wrote of Russia's relation to the marchland states of Eastern Europe, "Our whole policy towards the borderlands has suffered and still suffers from vacillation, want of continuity, extremes and lack of coordination in the working of independent departments. To this day, our policy in the borderlands remains unfixed. . . . Everything seems to depend on chance." [1] For Finland, his statement remains apposite both from the economic and the political standpoint. For, though the political frontier in the east may have been flexible, the commercial frontier has been rigid.

Fig. 4 shows the distribution of Finland's trade on a proportional basis. The increased free trade with the U.S.S.R. side by side with the flow of enforced reparations is one point which emerges. For Finland, trade with Russia has the further advantage that it can use land routes and ease the pressure on the much diminished mercantile marine. There are other isolated

[1] Borodkin, 'Finland, its place in the Russian state,' p. 25, St. Petersburg, 1911.

examples of positive commercial cooperation. Among the more recent is the investment of Russian capital in a new rayon plant—Viskoosa Oy at Oulu. Finland has most of the raw materials necessary to establish an artificial silk industry but has hitherto allied itself to cotton. The Finnish cotton industry has long historical associations with Great Britain. The U.S.S.R. is a natural source of materials for the steadily reviving cotton industry, which in pre-war times supplied four-fifths of the needs of the home market. As for the metallurgical industries, it is a matter for speculation whether the east will continue to provide a market for a free flow of metal goods after the enforced movement of reparations comes to an end. The country may find itself in the same position as in 1918 when an inflated metal industry was cut off from its market.

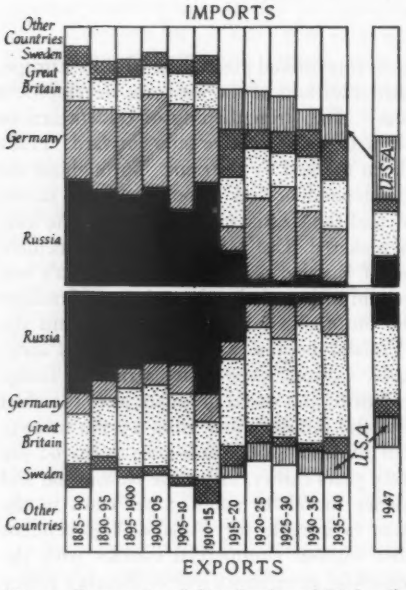


Fig. 4. Proportional distribution of Finland's foreign trade, 1885–1940, 1947

Difficulties there are. But post-war Finland is rich in possibilities. It is still the most forested country in Europe after Sweden, and Europe is hungry for timber and its by-products. Europe in return offers that diversity of goods which Finland cannot produce itself. Finland is capable of sustaining animal husbandry and, pre-war experience shows, substantial dairy exports. It is still not fully exploited or even explored in respect of mineral wealth. Four mineral sites are worked, of which the Outokumpu copper mine is most important. Six other deposits are known to be economically valuable. The Paatsjoki nickel deposits (now acquired by the U.S.S.R.) indicated the possibilities of arctic Finland. Many, like John Gabriel Borkman, though apprehensive of the strategic implications of development and restrained by lack of capital, are excited by the possible wealth contained in the Finnish portion of the Baltic Shield.

The future of Finland lies in its capacity to reconcile the interests of east and west. The miracle is that, in spite of the political neglect and economic pressure of the west, the economic neglect and political pressure of the east, Finland survives as the only independent unit of the old Succession States.

A FURTHER JOURNEY ACROSS THE EMPTY QUARTER

W. THESIGER

I HAD TRAVELLED IN the southern Rub' al Khali in 1945–46 and crossed it in 1946–47 and the spell of that great desert was upon me. Bertram Thomas [1] had travelled across the central sands from Dhufar to the Qatar peninsula in 1930, and the following year Philby [2] had made his great journey from the Hasa southwards to Mamura and thence westward to Sulaiyil. I had crossed the eastern sands from Dhufar to Liwa, near the Trucial coast, and then back to Dhufar by the Oman steppes.[3] Only the western sands still retained the challenge of the unknown (map following p. 148).[4]

I arrived at Mukalla on 5 November 1947 and after staying for a week with C. H. J. Sheppard, the Resident Adviser, I travelled to Saiwun in the wadi Hadhramaut. From here I intended to cross the Empty Quarter to Sulaiyil in the wadi Dawasir. I had hoped to accomplish this journey early in 1946 [5] when I had first arrived in the Hadhramaut from Dhufar, but had been prevented from doing so. I had then collected information about these sands and had made further inquiries at Najran which I had visited from the Hijaz in the summer of 1947.[6] Sa'ar and Karab had crossed this western desert to raid the Dawasir and Qahtan, but otherwise it was little known even to the Badu. It was reputed to be waterless and the dunes were said to be steep and difficult for camels. But I counted on finding Sa'ar to guide me across and had already sent a messenger into the eastern steppes to invite three of the Rawashid to join me. They were Musallim bin al Kamam, a shaikh of the Msaifar, and Salim bin Kabina and Salim bin Ghabaisha, two lads of the Bait Imani. All three had travelled with me during the past three years, Bin Kabina having crossed the Empty Quarter with me the year before.

While awaiting news of these Rawashid I decided to travel in the little known Sa'ar country to the north of the Hadhramaut. The Sa'ar are nominally under the Qaiti Sultan of Mukalla, but are in fact completely independent although they use Shibam as their market. They are a large and powerful Badu tribe who have been aptly described as the wolves of the desert. They are hated and feared by all the south Arabian desert tribes, whom they have harried unmercifully, raiding as far eastward as Mughshin and the Jaddat al

[1] Bertram Thomas, "A journey into Rub' al Khali," *Geogr. J.* 77 (1931) 1–37; also 'Arabia felix,' 1932.

[2] H. StJ. B. Philby, "Rub' al Khali," *Geogr. J.* 81 (1933) 1–26; also "The Empty Quarter,' 1933.

[3] W. Thesiger, "Across the Empty Quarter," *Geogr. J.* 111 (1948) 1–21.

[4] The author's spelling of Arabic names has been used on the map and throughout the paper except in some instances for which spelling has previously been established in the *Journal.—Ed. G.J.*

[5] Thesiger, "A new journey in southern Arabia," *Geogr. J.* 108 (1946) 129–45.

[6] *Idem*, "A journey through the Tihama, the 'Asir, and the Hijaz mountains," *Geogr. J.* 110 (1947) 188–200.

Harasis, and northwards across the Empty Quarter to spoil the Dawasir, the Qahtan and the Murra. Boscawen had hunted oryx in their country in 1931 and Ingrams [1] paid a cursory visit to the edge of their territory in 1934; but neither of them did any mapping. I was anxious to link up the traverses which I had already made in southern Arabia, from the wadi Halfain to the Masila, with Philby's work in 1936 [2] between the Yaman mountains and the desert from Najran to Al 'Abr and Shabwa.

I left Shibam on November 20 accompanied by a Sa'ari and his young son with two hired camels. We travelled up the Sirr, a large wadi in which there were a number of Kathiri villages, and after crossing the watershed at 3900 feet, descended into the Raidat al Sa'ar at Khasmut. This far-famed wadi is one of the tributaries at the head of the Makhia and constitutes the very heart of the Sa'ar country. It runs through a barren limestone plateau among small hills, and its low cliffs are crowned with stone buildings and watch towers. The shallow valley [3] is only about 150 yards wide and is generally banked across at regular intervals for cultivation; indeed, where it is not so terraced the watercourse has cut down 10 feet through deposits of silt. At the time of my visit the valley was green with crops of "dhurra" (sorghum) mixed with a low-growing bean, sown on the last July floods. Such floods are infrequent and drought in 1940–44 had coincided with famine in the Hadhramaut; whole families had died and many of their houses were still untenanted. A few date palms grow in the head of Raidat al Sa'ar and everywhere the "ilb" trees (*Zizyphus spina-Christi*) are carefully preserved for their fruit,[4] a valuable supplement to the meagre rations of these Badu.

The Sa'ar had collected in the valley to harvest the crops and Misad bin Tanaf, shaikh of the Al Bilaith Sa'ar,[5] was camped in a sun-scorched side-valley with a few of his retainers. They had heard of me as a result of my previous wanderings and received me warmly. I liked the Sa'ar and found them a pleasant friendly people, virile and upstanding and innocent of the corroding avarice of the Bait Kathir. They are reputed by the other tribes to be treacherous, probably a slander inspired by the perpetual enmity which characterizes their relations with their neighbours; but their reputation for godlessness is well merited, since they never pray nor fast,[6] saying that the prophet exempted their forefathers from both. Like all the southern Badu,

[1] W. H. Ingrams, "Hadhramaut: a journey to the Sei'ar country . . .," *Geogr. J.* 88 (1936) 524–51; also 'Arabia and the isles,' 1942. Boscawen never published an account of his journey.

[2] H. StJ. B. Philby, "The land of Sheba," *Geogr. J.* 92 (1938) 107–32; also 'Sheba's daughters,' 1939.

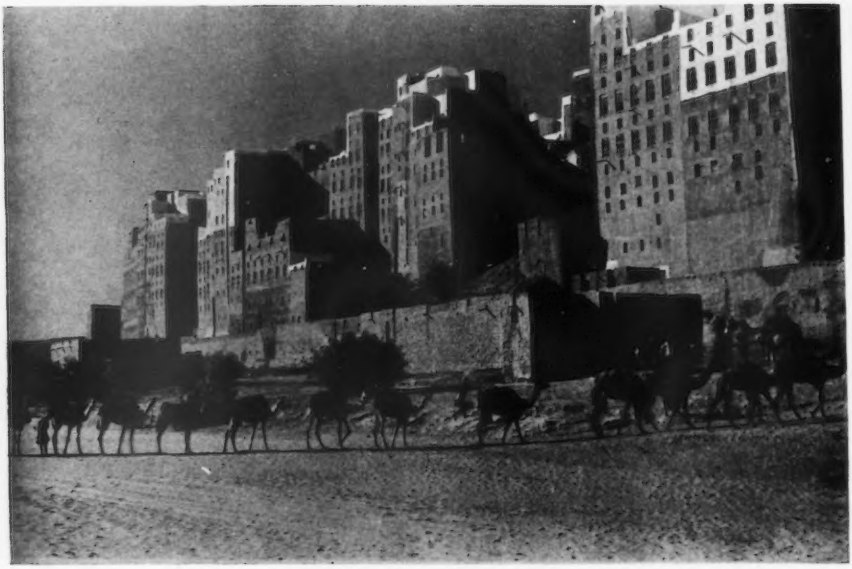
[3] The wadis flowing north from the Hadhramaut watershed are shallow at their heads, in contrast with the north-flowing wadis from Dhufar which begin abruptly in deep canyons.

[4] In the northern Mahra country tribesmen angrily protested when the Badu accompanying me knocked the fruit off ilb trees although there was no cultivation there to give them a proprietary right to the trees.

[5] The Sa'ar are divided into Al Bilaith and Hatim. Al Bilaith sections are: Al ba Rumaidan, Al Qarwan, Al Haqail, Al Dauman, Al 'Ali, Al Quainif, Bani Musallim, Al Siqair, Bin Mazrua, Al Muquam, Al Lifnakh, Al Tirqim, Al Fizair, Bin Mushamid, Al Rais.

[6] The Bin Ma'aruf section who are under Saudi influence both pray and fast.

1. Dune crest in Dhafara sands



2. Shibam in Hadhramaut

3. Crossing Bani Ma'aradh sands

they are a small and lightly built race. They wear short white or indigo-dyed loin-cloths, and often wrap another piece of material crosswise over their chests with the ends thrown over both shoulders. A few of them wear shirts reaching to just below the knee, generally sleeveless and open down the sides from the arm to the waist. The elders wear a rag round their heads, while the others hold back their long tresses with an "ogal" of rope or thong. All the men and most boys of more than fourteen years of age wear the distinctive curved Sa'ar dagger [1] with its small horn handle and silver-mounted sheath set with cornelians; there are few who do not carry a rifle, either a ·303 Martini or Lee Enfield, and wear a well-filled cartridge belt.

Misad was travelling next day to Manwakh and suggested that I should accompany him. We travelled down the wadi to the temporary wells of Al Khail near his family fort at Ba Rumaidan,[2] and then over the watershed at 3470 feet and into the Aiwat al Sa'ar at Manwakh well. Here the Aiwat is a broad sandy valley 3 miles across, enclosed by sheer-sided cliffs 600 feet high, a refuge for numerous herds of ibex (*Capra hircus sinaitica*). Unlike the Makhia, it is of no great length and is formed above Manwakh by a number of large tributaries of which the Sibr is the longest. The well, which is about 200 feet deep and stone lined, is situated on the northern side of the valley under an isolated and conspicuous peak. This well and Zamakh in the wadi Hudhi, a similar stone-lined well said to be 240 feet deep, are the only permanent water in the Sa'ar country. There are a number of rock pools and shallow wells such as Shagham in the Makhia and Khasmut, and others in Raidat al Sa'ar which hold water for a year or two after rain, but Tamis is in the 'Awamir [3] country and 'Abr belongs to the Karab.[4] Water is raised by hand among these southern Badu tribes who never use their camels for this purpose as is done in the deeper wells in the Najd. Four or five men and women, singing a refrain as they work, draw on each well rope, to either end of which is attached a leather bucket so that as one descends empty the other is drawn up full. The well ropes pass over small pulleys tied to a scaffolding round the well. The ropes, pulleys and leather watering troughs are removed by each family when they have finished.

[1] Wearing daggers and carrying rifles is not confined to the circumcised. Among the Sa'ar and Karab, as among the Rawashid (Bait Imani), Bait Kathir, Manahil and Mahra the operation is sometimes delayed until a lad is as much as twenty-five years old and may be celebrated at the same time as his marriage. More often it is done when he is sixteen to eighteen years old but seldom when he is younger. On the Trucial coast some of the Bani Yas and Manasir (Al Bil Khail) wait until the boy is fifteen to sixteen.

[2] Misad bin Tanaf is frequently referred to as Ba Rumaidan.

[3] The 'Awamir are Shanafir. They are divided into Al Badr (Al Haiyu, Al Kalila, Al Habanin, Al Kasabib, Al Awaini, Al Halatah, Al Maqadha) and Al Laz (Al Khamis, Al Jafira, Al Wa'il, Al Hatatba, Abd al Baqi, Al Shaghaiba, Al 'Amr, Bait Haithul, Al Amburah, Al Asid). They also claim Al Lihaifi (Bilhaf). They live in the mountains and steppes north of Tarim and their Badu sections are scattered throughout the south as far as Dhafara and Al Hamra on the Persian Gulf. They also own a few small villages on the south-west side of Jabal al Akhdar in Oman.

[4] The Karab are divided into Al Awaira (Al Qutaiyan, Al Qanas, Al Ajman), Al Misfir (Al Hassan, Al Shakal, Al Farai, Al Dhautan, Al Hawlan, Al Lakrab), Al Zaid, Al Qa'ta and Al Mutahala. The Karab are from the Bal 'Ubaid which includes Al Hataish, Al 'Amr, Al Haid, Al Hamudish, etc. They are a small tribe but noted as raiders, and they live to the west of the Sa'ar.

The Hiriz enters the Aiwat from the south at Sulhaba, a few miles below Manwakh, and here the Sa'ar cultivate a flood crop of dhurra and beans. This year the heavy rain in July had produced exceptionally good crops, which were nearly ripe at the time of my visit. The valley was full of Arabs, mostly Sa'ar but also Karab, Manahil, 'Awamir, Mahra and Rawashid,[1] who had assembled to discuss truces and blood money. Here I met an old friend Abdullah bin Misad, a one-eyed Bait Imani shaikh, with Muhammad, Salih bin Kalut's second son, who had also been with me during the past two years. Muhammad on hearing my plans begged to join me, and on learning that Musallim bin al Kamam had not yet returned from the Dahm country I agreed and arranged to meet him in Raidat al Sa'ar.

The news was all of raids and rumours of raids. A formidable band of a hundred and twenty 'Abida under the redoubtable Bin Shaqar [2] had passed eastward along the edge of the sands a few days before, while to the west a raiding party of a hundred and forty Manahil, Sa'ar and Mahra under a Manhali, Mabkhaut bin Duailan, had recently fallen on an encampment of the Hindi Yam in the wadi Itima between the Jauf and Najran, looting a large number of camels and killing several of that tribe. The Manahil had lost nine killed including their leader Mabkhaut, nicknamed Al Bis (the cat), who had remained behind to hold up the pursuit and had been rushed when his rifle jammed after shooting five of the Yam. The greatest raider in the south, his exploits and daring were legendary among the tribes. He had guided me the year before from Salala to Mukalla and I was grieved at the news of his death. This raid had been intended as retaliation on the Yaman tribes of Dahm [3] and 'Abida who for the past ten years had repeatedly plundered the 'Awamir, Manahil, Mahra and Rawashid and who, because they were better armed, had carried all before them. It had followed two others in which Ibn Saud's Badu had been the unintended victims, once early in 1946 when the Yam had been pillaged, and again early in 1947 when the Qahtan had suffered. In each case the "Mishqas," [4] provoked by their casualties and the very serious loss of stock at the hands of the Dahm and 'Abida, had raided back in Yaman territory; but whereas the Dahm and 'Abida, the greater part of whom are settled Arabs, had withdrawn to the edge of the mountains, the nomadic Yam and Qahtan were out grazing their herds in the desert east of the

[1] Rawashid sections are: Msaifar, Mdairaba and Bait Imani. For Mahra and Manahil, see *Geogr. J.* 108 (1946) 141, 143.

[2] Murzuk bin Shaqar is of the Sa'ar, but he took refuge with the 'Abida after killing one of his family, and has married from among them. The 'Abida are a semi-sedentary tribe centred on Marib. They are from the Qahtan and among their sections are Al Harais, Al Fiyah, Al Mishal, Al Jidailan.

[3] The Dahm are semi-sedentaries with some Badu sections. They centre on Jauf. They are divided into Bin Anauf (Al Mutada, Al Saida, Al Yahyah, Al Raiya, Al Shailan, Al Muraiziq) and Dhu Hassain (Al Mahashama, Al Hazim, Al Jadid, Al 'Abaid, Al Sibtan, Al Zuamil, Al Dhuwai, Al Tawaba, Al Amalsa Hamdan).

[4] The Yam, Dawasir and Qahtan refer collectively to the Sa'ar, Karab, Manahil, Mahra and Al Kathir tribes as "Mishqas." None of these tribes call themselves by this name. The Sa'ar and Karab however use it to refer to the tribes to the east of them, namely the Manahil, Mahra and Al Kathir Badu, while the Dahm and 'Abida use it for the 'Awamir and the tribes to the east of them and call the Sa'ar and tribes to the west of them as far as Baihan, Al Mishriq.

Jauf, and so it was on their herds and encampments that the raiders had fallen. It was ill luck, for the Mishqas had no wish to anger Ibn Saud and embroil themselves with the larger and more powerful tribes of the Yam Qahtan and Dawasir, but they were hitting back in a fight for survival against repeated Yaman aggression.[1]

Misad ba Rumaidan remained at Sulhaba but sent two of his cousins with me to the Hadhramaut. We crossed the watershed into the Makhia, where we noticed the tracks of a leopard,[2] and then travelled down the valley, between cliffs 400 to 600 feet high, to Tamis. One or other of my companions scouted continuously ahead on the watch for raiders, and near Tamis located a large body of Manahil driving their booty down to water at the well. The Manahil had recently captured the two Government posts at Saum and Urr in the Masila and we thought it best to avoid them, especially as their relations with the Sa'ar were, as always, uncertain. We kept them under observation until they had moved off, and then went down to the well, which Van der Meulen [3] had visited in 1939. Here there was abundant fresh water at the bottom of a hole in a large rock sunk in the stream bed. We camped nearby and were joined after dark by a young Rashidi, 'Amair bin 'Umr, who with Salim bin Kabina had been following me from Shibam. 'Amair had left Bin Kabina at Sulhaba with his half-brother Muhammad, to rest his foundered camel and to join me later at Raidat al Sa'ar.

Now that Bin Kabina had arrived I was anxious to return to the Hadhramaut in order to start on my main journey. We therefore travelled fast for

[1] I am myself convinced that if these Yaman tribes were restrained rather than encouraged in their depredations, the chronic and very dangerous insecurity of the south-western deserts would soon disappear.

[2] T. C. S. Morrison-Scott writes: "There have been very few records of leopards in Arabia. In fact I believe there are only three skins known to science. In 1833 Hemprich and Ehrenberg published a description and plate of a specimen from "Arabiae felicis montibus prope Gumfudam," which I take to be Qunfidha on the west coast in latitude 19° 05′ N. They gave this leopard the name *Felis nimr* and included under this head a skin from Abyssinia. Botta, in his 'Relation d'un voyage dans l'Yémen entrepris en 1837' (1841), mentions seeing "une panthère" near Cahim, and Bertram Thomas, in his 'Arabia felix' (1932), says that there are leopards in the Qara mountains on the south coast. The next thing is the specimen which you brought us in 1946 from Asir (Brit. Mus. No. 46.260), and in 1948 Major T. Altounyan gave us a skin (No. 48.312) from the Jebel Samhan in the Qara. These two specimens, which I have called *Panthera pardus nimr*, have the ground colour of the coat very pale, a sort of sandy buff. Leopards vary a good deal in pattern but nearly all African and Indian leopards I have seen have the ground colour a rather rich, warm, light brown. There is, however, a specimen in the British Museum (No. 10.10.3.7.) collected by Drake-Brockman at Upper Sheikh, Somaliland, which is a very good match for the two Arabian skins. It is interesting in view of this that Hemprich and Ehrenberg also applied the name *nimr* to a skin from Abyssinia. The type specimen of *P. p. nanopardus* (No. 4.5.9.35) from Italian Somaliland is not dissimilar so far as the ground colour goes but its spots are considerably smaller. The Sinai leopard *P. p. jarvisi*, and the Persian leopard *P. p. saxicolor*, are also pale leopards but they both have thick, soft-haired coats in contrast to the Arabian, African and Indian beasts which have short, hard coats."

The fragmentary skin of a wild cat collected by me in Ramlat al Ghafa in 1947 (see *Geogr. J.* 111 (1948) p. 5, footnote 2) has since been identified as *Felis margarita* Loche, the Sand Cat. This is the first time it has been recorded from Arabia. It occurs in the western Sahara and in southern central Asia.

[3] D. van der Meulen, 'Aden to the Hadhramaut,' pp. 203 *et seq.*, London, 1947.

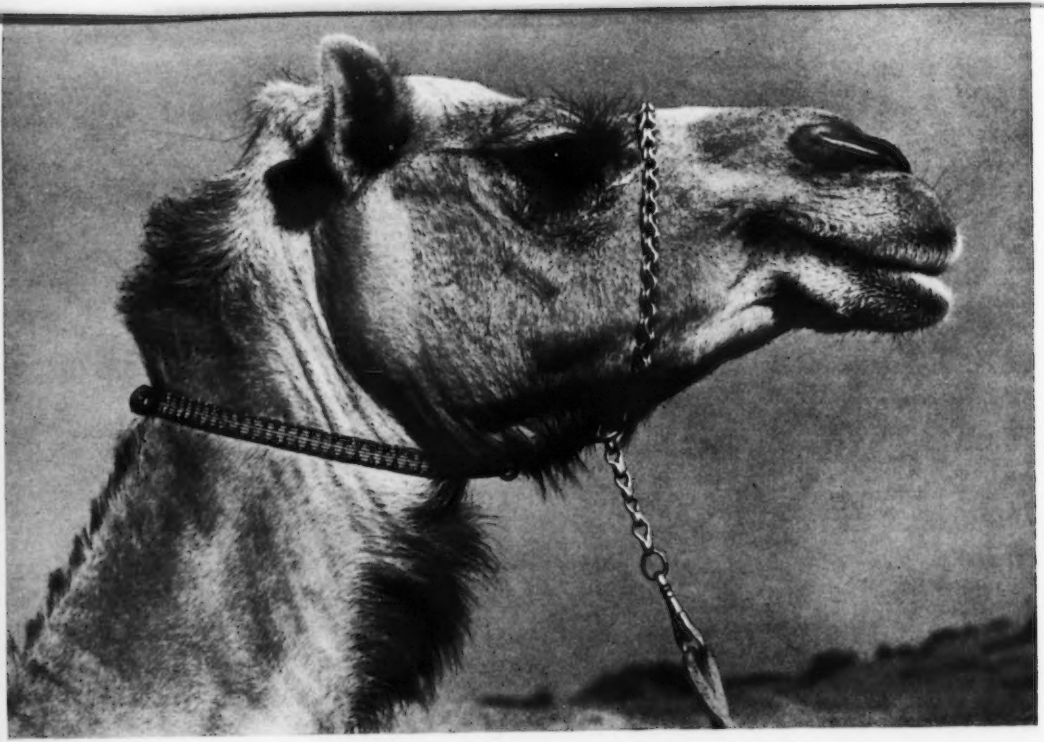
four days from sunrise to sunset across the barren limestone plateau, at first between the tributaries of the Thiriba and Saiq, both of which join the Makhia, and then down the Banin. We passed on our left the palm groves of Quff of the 'Awamir where the Saiq and Khudhra rise, and slept each night on the desolate "jaul" while the storm clouds banked up all round us and the lightning played over the Empty Quarter to the north. On December 3 we dropped down into the Hadhramaut valley by the Kuda pass and arrived at Saiwun, having covered 225 miles since leaving Shibam.

'Amair had told me that Salim bin Ghabaisha was probably at Salala, where he had gone to sell a camel after parting from me at Mukalla in March. He was only seventeen years old and before this visit to Mukalla he had never been out of the Empty Quarter, had never seen a house, not even an Arab shack, nor met a European besides myself. Yet he now flew from Salala to Mukalla at my request and then motored up to Saiwun to join me. I was delighted to see him, for not only was he a charming and self-reliant companion but also a keen and successful hunter. My party was now complete, and after spending a very pleasant fortnight with A. Watts and E. R. Johnson, the Political Officers in the Hadhramaut, I left Shibam on December 17. Ali bin Jurbua, a shaikh of the Hatim Sa'ar, had been there on a visit and he travelled back with us. We reached Raidat al Sa'ar at Zimra in the Hatim [1] territory in four days, and remained there until we heard four days later that Muhammad and Bin Kabina had returned to Sulhaba.

The land was full of rumours and alarms. Abdulla bin Nura, often known by his family name of Bin Maiqal, had recently arrived at Manwakh with his Bin Maaruf Sa'ar, fleeing from the wrath of Ibn Saud, incurred by the recent raid upon the Yam in which some of his Arabs had been implicated. Although these Bin Maaruf are of the Hatim, they no longer live upon the Sa'ar plateau but in the sands and steppes to the north, and for a dozen years or more have acknowledged Ibn Saud as their overlord and paid him tribute through the Amir Turki bin Madhi at Najran. They were grazing their herds in the Raiyan, where the pasture was rich after the recent rain, when word reached them that the Yam and Qahtan were massing, having been authorized by Ibn Saud to raid the Mishqas tribes. They had therefore promptly fled eastward to seek refuge among the other Sa'ar. A day or two later we heard that advanced parties of the Yam had already swept down into the Karab country, lifting several hundred camels and killing any Arabs whom they met.[2] The Badu had immediately evacuated the area between Al 'Abr and Zamakh, and it seemed probable that they would also abandon Manwakh and withdraw into the broken country along the middle Makhia. It was important for me to reach this well before the Sa'ar deserted it if I was to find guides and camels for my journey northwards across the sands. I therefore left Raidat at once and arrived at Manwakh in the evening of December 28.

[1] Sections of the Hatim Sa'ar are: Bin Jurbua, Bin Ma'aruf, Bin Aun Bin Kandish, Bin Hawailan, Bin al Dilakh, Bin Dahaiyan, Bin Hitaish, Bin 'Ali, Bin Milhi, Bin Abaidun, Bin Abdallah Bin Aun, Al Da'alqa, Al Misadsa, Al Lihaiyin, Al Muhariqa, Al Ja'ain, Al Alj, Al Zibadala, Al Dahabja, Al 'Amr, Al Asakir, Al Witaida, Al Abrash, Al Hirath, Al Basais. Their head shaikh is Yislim bin Jurbua.

[2] In the middle of May 1948 Yam raiders engaged a mixed force of Sa'ar and Karab near Al 'Abr and killed twelve of them, losing five themselves.



4. Author's camel from Oman

5. Salim bin Ghabaisha, one of the author's party

6. Sa'ar at Manwakh well

Some Bin Maaruf came past us at sunset, disturbed by unidentified tracks which they had found farther up the valley and which they feared might be those of Yam scouts, for Badu push scouts out far ahead to locate an encampment and then, after an all-night march, fall on it at dawn. From them we heard that Bin Maiqal was at Sulhaba.

In the sharp cold of the winter morning we rode down there, past large herds of fat milch camels which the herdsboys had just driven forth to pasture from their couching places around the tents. These small, black, goats' hair tents [1] were scattered upon the dunes; naked infants romped around them, while dark-clad women moved about gathering sticks and herding goats. The Bin Maaruf formed up to receive us and greeted us, as is the Badu custom, by firing low over our heads and then swept down on us in a wild rush, yelling and brandishing their daggers. We alighted and joined their coffee circle and met their chiefs and some Karab, Manahil and Mahra who were with them, as well as a few diseased and decadent Hadhramaut "saids" who had come up here, intent on making a profit from the credulity of the tribesmen while basking in an odour of sanctity. I was delighted to greet young Bin Kabina, looking well if ragged. He had received my letter on the lower 'Araba, had taken it down to Ghaidha al Mahra on the coast to get it read, had then returned to the 'Araba, changed his camel and come on to the Hadhramaut and then up to Sulhaba, in all 760 miles.

Shortly after our arrival a dozen Sa'ar came racing across the low dunes; their camels, travelling very fast, were urged on by the wild yells of their riders to even greater efforts. These lads, sons of shaikhs and the very flower of the tribe, were scouts who set out each day at dawn to scour the surrounding desert, keen eyed for the tracks of strangers. Hearing the firing, they had supposed the camp attacked and had ridden back to help. Lithe, hard-bodied and alert, they rode their splendid beasts with effortless mastery. Very different at first sight from the other Sa'ar, the Bin Maaruf wore white Badu shirts cut with long pointed sleeves falling to the ground, and head-cloths and ogals of the northern type. They were distinguished too by the quality of their mounts as much as by the indescribably easy grace with which they rode them, while their herds were of she-camels kept for breeding and for milk.[2] Elsewhere among the Sa'ar I had been struck by the number of

[1] In southern Arabia only the Badu in the sands use tents. Those who live on the steppes and plateau dwell in caves or under trees. On the Oman steppes however the Duru and other tribes do use tents. Those of the Rawashid, Manahil and 'Awamir who live in tents in the sands leave them behind when they enter the steppes. Among the Sa'ar only the Bin Maaruf use tents. The sand Arabs are also distinguished from the steppe and plateau Arabs by using camel litters for carrying their women and infants when on the march.

[2] The Bin Maaruf, like the Rawashid, Manahil, Bait Kathir and northern Mahra (the Harawiz, Bin Zabnut and Amarjad), slaughter and eat nearly all bull calves at birth in order to save the milk for their own use. Because of this there is among these tribes always a dearth of bull camels from which to breed. It is important, when buying a camel for milk, to make sure that it will allow itself to be milked when separated from its calf, since some of them withhold their milk. The Rawashid live almost exclusively on milk, but the Sa'ar depend largely on sorghum grain which their women grind between two flat stones. Unlike the Oman tribes, these Badu seldom eat dates. Women are allowed to milk camels among the Murra, Sa'ar, Dahm, Karab, Nahad,

bull camels kept by them as pack animals for the carrying trade in the Hadhramaut.

My four Rawashid now busied themselves buying each of us a riding camel and four spare camels to carry water. The previous year I had crossed the eastern sands with four Badu and only one spare camel, but this year I wished to carry more food and water. After endless haggling we finally bought the camels which we required, although their owners profited by our need to charge us unheard-of prices.[1] These camels were very fat and would have reserves on which to draw during the hungry marches ahead of us, but this fat would distress them on the soft steep dunes. They were fresh from pasturage and their backs were soft and unaccustomed to the saddle, yet we would have to load them heavily and shortage of water would force us to drive them hard. Under such conditions they were certain to develop saddle swellings which turn all too easily to fistulas.[2]

We also had interminable discussions with our prospective guides. The Sa'ar all confirmed that nowhere in these eastern sands was there water, so that from Manwakh we should have 400 waterless miles before we reached the Hassi. They told us that in the north the sands consisted of giant dune chains, soft and steep sided, among which a good guide would save our camels much effort. Sa'ad bin Daisan was generally acknowledged to be the best of their guides, and at first he agreed to come with us as far as the Hassi, a day's journey to the south of Sulaiyil. But now that we were nearly ready he excused himself. The Sa'ar argued that they were at war with the tribes beyond the sands and that as soon as we encountered them we should be shot at sight or followed up and rushed during the night, for our clothes, saddlery and camel tracks would mark us out as coming from the south. Not only did they repeatedly declare that no Sa'ar would go with us but they, the Manahil and Mahra, tried to dissuade my Rawashid from accompanying me, saying that they were too young and inexperienced to know what lay ahead of us. Young they certainly were, for Muhammad was perhaps twenty-five years old, 'Amair twenty and Bin Kabina and Bin Ghabaisha seventeen, yet they refused to be intimidated or to desert me.

For us to travel without a Sa'ar "rabia" would entitle the Sa'ar by tribal custom to follow us up and kill us. Some of them were talking almost openly of doing so, encouraged by the fact that the Manahil had captured two Government posts and had so far escaped unpunished. Our rifles, ammuni-

'Abida, Yam, Manasir and Humum but never among the Rawashid, Bait Kathir, 'Awamir, Harasis, Wahiba, Manahil, Bani Katab, Bani Yas, Mahra or Qarra. Among the Qarra they may not even milk goats.

[1] In 1947 an average riding camel cost 120 Maria Theresa dollars among the Sa'ar, 200 M.T. $ in Dhufar and 70 M.T. $ at Buraimi in Oman.

[2] We decided to use the Sa'ar "qitab" or loading saddle because the "shidad" or "haulani," the Omani saddle on which the Rawashid and other eastern tribes all ride, was unprocurable here. We had but one good one with us, on which I rode. The haulani is very light and consists of a wooden tree girthed over the withers, to which is attached a horseshoe-shaped pad, set over the loins behind the hump. On this the rider kneels. The qitab is rather similar but the tree is heavier and palm-frond mats replace the horseshoe-shaped pad. The Sa'ar ride on the "shad," a two-poled saddle differing from that used throughout northern Arabia by the outward angle at which the poles are set and by its lighter weight.

tion, camels and the silver [1] which we carried were temptation enough to any of them, while several of their sections had long and bitter blood feuds unsettled with the Rawashid. From among the Karab we might find guides, but their company would afford us no security from the Sa'ar. Bin Daisan still seemed tempted to come with us, despite the protests of his family, and by increasing his promised reward I once more secured his rather uncertain agreement. But now that we were ready to leave a Mahri arrived from Shagham with news that Bin Shaqar and the 'Abida had fallen on some Rawashid herds in the sands, lifted a great number of camels and killed two of the herdsmen. They in turn had been attacked during the night by a Rawashid pursuit party [2] at Thamud well and had lost five killed. After watering at Shagham two days before, they were even then moving very slowly westward with at least two badly wounded men. From the 'Abida we could hope for no mercy should they cross our tracks, and so we again delayed our departure.

Finally on January 5 we moved down to the well and filled our skins. Bin Daisan had agreed to join us with two of his family, but he held back and at last sent word that he would not accompany us. Two young Sa'ar, Salih and Sadr, tempted by the promised reward, volunteered in his stead. Neither of them had crossed the sands, but they had often visited the Hassi from Najran and knew its direction. I accepted their offer, since their company should give us safety from the Sa'ar. By now it was midday and the crowd of Arabs and camels on the well had exhausted the water, so we camped there in order to fill our skins, fourteen in all, during the night. Early next morning we watered our camels,[3] but discouraged by the cold and the muddied water they refused to drink deeply and we were forced to pour a skinful down the throats of the most obdurate; it would be fifteen to sixteen days before they would drink again. Then, driving our camels before us, we entered the limestone hills. We camped in a cleft of Dhulq al Jahfa on the southern edge of the steppes, alert and watchful throughout the night, since we distrusted the Abdulla bin Aun Sa'ar behind us, and were apprehensive lest the 'Abida raiders should be nearby. Soon after sunrise we came upon a broad beaten track where Bin Shaqar had passed two days before. Bin Kabina and 'Amair lingered behind to try to identify the looted stock by reading the confusion in

[1] Rupee notes are now generally accepted in the Hadhramaut. Among the southern Badu they have little circulation and silver Maria Theresa dollars are their currency. These are also used throughout the Yaman, and at Najran, in the wadi Dawasir and north as far as the Aflaj. Saudi reals are used elsewhere in Saudi Arabia. On the Trucial coast and inland as far as Buraimi rupees are used, and Maria Theresa dollars in the rest of Oman and Dhufar.

[2] This pursuit party had used as its battle cry on this occasion, "Murzuk ya Talabta" (Murzuk, we are out to get you). Murzuk was Bin Shaqar's name. They were thus identified as Rawashid, since the Mahra, the only other tribe who might have constituted the pursuit, would certainly have used their war cry of "Ya Dakai."

[3] All the water in the Sa'ar country is fresh and no salt bushes grow there. The Sa'ar consequently mix salt in the water which they give their camels to drink. I had never seen this done by the Badu farther east because the water in the sands there is brackish and salt bushes are abundant; while on the eastern steppes, where the water is fresh, there is "rimth" (*Haloxylon salicornicum*) and "'aradh" (*Salsola cyclophylla*) as grazing for the camels. In the mountains nearer the coast the Mahra and Bait Kathir often feed their camels on sardines.

the sand. When they joined us, laughing and racing across the plain, I little suspected that Bin Kabina had recognized the tracks of two of his three camels among the spoil.[1]

It was monotonous riding across the featureless gravel steppes which merged imperceptibly into the low sands of the 'Uruq al Zaza, and by midday the north-east wind was blowing strongly, bitter cold but welcome to us now that we were in the sands, since it wiped out our tracks and secured us from pursuit. We pressed on until it was night, hoping in vain to find grazing, and then groped round in the dark feeling for firewood with which to bake the girdle cakes on which we lived. 'Amair damped the wheat flour, kneaded it, and then briefly laid the inch-thick discs upon the embers, before burying them in the hot sand beneath the fire. After they were thoroughly baked, he divided them by lot among us and we ate them dipped in a little butter. Such was our unvarying evening meal and the only food we ate throughout the day, other than a handful of dates at dawn, followed by the bitter black cardamum-flavoured coffee of the Arabs. Then as the sun rose we would start. At first we would drive our camels along tied head to tail in groups of three and four, while we walked beside them to keep warm in the bitter cold.[2] Later, as the heat of the sun increased, we would untie them and climb up their shoulders into the saddle to ride on without a break till evening. The monotony of the long days was broken by desultory conversation, an occasional burst of song, short diversions to graze our camels on tufts of withered grass, and unsuccessful attempts to check the alarming drip from our water skins. These I had bought in Mukalla and from inexperience had accepted several sheepskins which sweated badly, while even our goatskins had not been used long enough to become properly watertight.[3] In consequence, nearly half our water was lost to us before we reached the Hassi and we were soon compelled to ration ourselves to just over a pint a day. This was however fresh and very different from the brackish foul-tasting water which we had carried the year before from Ghanim across the sands.

These southern sands of the 'Uruq al Zaza and later the Bani Milaisan and Al Khashim were very tedious—featureless plains with occasional small drab-coloured dunes, devoid of vegetation other than a few "abal" bushes

[1] By tribal custom, if a raiding party is intercepted and defeated, any spoil which at the time was in their possession becomes the property of their victors. If they had been defeated by a pursuit party from the tribe which had been looted, the camels would have been returned to their original owners.

[2] Deep and painful cracks developed on our bare feet owing to the cold. Badu in the sands wear socks as a protection against the cold in winter or the heat in summer.

[3] Water skins, when new, should be soaked in water for a couple of days and then filled and left for another day. After this they should be well oiled with sesame or coconut oil and then filled again and left for four or five days before being oiled again. They are then ready for use. They should be oiled whenever they have become dry and hard after long use. The Badu roll them up when not in use, and are always careful not to place a skin containing water directly on sand or earth but lay a cloth or bed of herbs under it. The best method of stopping a hole is to plug it with a splinter or small piece of wood slightly bigger than the hole. On a long journey it is as well to carry a spare *new* water skin to cut up for patches and also to ensure that the Badu have a "makhraz" or awl with them. This is essential for patching skins and is difficult to improvise.

(*Calligonium comosum*) or desiccated tufts of "alji" (*Dipterygium glaucum*), "birkan" (*Limeum* sp.), or "qasis" (*Cyperus* sp.), remnants from the rain in July 1945. Beyond them were the long parallel dune chains of the Qaimiyat, running north-east to south-west and separated by hard sand-flats a mile across. These dunes were of a uniform height of only 150 to 170 feet, but their soft steep inclines faced south and the successive floundering ascents exhausted our famished camels. To the north we entered the gentle downs of Awariq and here we unexpectedly came on the fresh tracks of a pelican [1] which had walked in a straight line across the sands. Since entering the 'Uruq al Zaza we had seen occasional "rim" (*Gazella marica*) and once we had shot at and missed an oryx (*Oryx leucoryx latipes*). We had passed a fair amount of spoor and each day we had hoped to come on grazing, for showers were said to have fallen in these sands in July. Such showers are however very local and usually only wet a few square miles in the immensity of this desert. Badu questing for pasturage would be guided to these patches by the tracks of oryx and "rim," but we could ill afford to lengthen our journey. However, on January 12, seven days after leaving Manwakh, we passed abundant spoor and at midday found a narrow belt of herbage where the green tasselled qasis grew in foot-high tufts. Since the start of our journey our camels had eaten nothing but occasional mouthfuls of dried-up herbs and they were already showing ominous signs of exhaustion, trembling and lying down on the steeper slopes. Ahead of us were the giant dunes, and we could count on finding no further grazing until we entered the "hadh" pastures (*Cornulaca monacantha*) far away to the north. We therefore loosed our camels to graze till sundown and scattered to hunt, for we were hungry for meat; but although "rim" were plentiful and Sadr saw a herd of twenty oryx, we were unsuccessful. During the next two days we saw twenty-eight more oryx, mostly on some green "sabat" grass on the edge of the Jilida plain.

We were now some 60 miles to the east of the limestone plateau of the 'Aradh which we hoped to strike south of Qariya well. The 'Aradh is a 210-mile extension of the Tuwaiq range [2] to the south of the wadi Dawasir. The escarpment faces west and in the Dawasir gap the cliffs are 900 feet high, but they are said to be very much lower at their southern end where they terminate 80 miles east of Najran at the Khashm al 'Aradh. Along its eastern side the 'Aradh slopes gradually down to the sands, which generally lie back 2 to 4 miles from the summit, but the continuity of the plateau is interrupted by the Mindifin sands which begin 50 miles from the Khashm and extend north for 25 miles. It is not clear from Badu accounts whether these sands fill a break in the escarpment or simply overlie it, but it seems probable that there is a gap here through which the wadis Atfain Najran and Habuna once found their way. Such a gap occurs where the Dawasir flows east between the 'Aradh and Tuwaiq, and there is another small gap at

[1] The Bait Imani told me that five years previously several large white birds, evidently pelicans from their description, appeared near the wadi Shait on the edge of the sands. On previous journeys I found a coot on a rain pool in the lower wadi Aidam and another on the ditch of salt water at Mughshin, where I also noticed duck feathers.

[2] Jabal Tuwaiq is of Jurassic limestone. The Dawasir often refer to the 'Aradh as Tuwaiq.

Qariya. But it is possible that the sands here overtop and bury the range, since I got a reading of 3200 feet at Bani Ghadhai near the top of the 'Aradh, and 3120 feet for a dune summit which was by no means the highest, rather farther to the south. The extent of the 'Aradh is not shown on any existing map.

It seems clear that in the past there was a drainage system across Arabia from the Yaman mountains to the Persian Gulf near the present Sabkha Mutti, and I am inclined to think that the Khabb and its adjacent wadis once flowed north-east [1] round the Khashm al 'Aradh and deposited the igneous pebbles which I found on the flats in the Awariq sands. These angular pebbles were of porphyry, granite and rhyolite, jasper, diorite, epidiorite, felspar and felsite, ironpan, and limestone, and all showed a high glaze due to wind action. Just south of the Jilida there were deposits of silt 2 feet deep on the bottoms, and here the golden red dunes in places partly overlaid ridges of quartz conglomerate 20 feet high. The silt deposits may indicate that exceptionally heavy floods can still find their way down to this point along some of the flats, and the two Sa'ar who were with me believed that they had been fetched down by floods in the Kharita—the name given to the wadi Khabb where it enters the sands. The Jilida plain itself consisted of coarse grey sand and fine gravel through which the underlying conglomerate intruded, and was covered in many places with small stones among which jasper and porphyry appeared to predominate. Badu have told me that this extensive plain extends north-east to join the Abu Bahr, which in turn connects with the general plains running down to Jabrin. If this is so, and if this silt was deposited by water rising in the Yaman mountains, there is a route free from sand across the Empty Quarter from Najran to the Hasa.[2] I noticed however further deposits of silt in the Bani Ma'aradh at 2930 feet, whereas those which I crossed in the Awariq were at 2520 feet. These Bani Ma'aradh deposits may have been washed down off the 'Aradh itself. They were only about 2 feet deep and appeared to have been left there by water comparatively recently [3] and not to be the eroded remnants of much deeper beds laid there before the Mindifin gap was closed by sand. In any case the rock fragments with which these bottoms were strewn were of limestone and I did not notice any igneous pebbles, which suggests that if a river had once flowed through the Mindifin gap its course was farther to the south. I found no igneous stones in the sands south of Awariq and none north of the Qaaima. In the 'Uruq al Zaza the limestone floor was exposed in places, and in the Bani Ma'aradh and Mujairi sands north of the Jilida, low ridges and mounds of limestone and

[1] See H. StJ. B. Philby, "Rub' al Khali," *Geogr. J.* 81 (1933) 11, 17. I found that the plain on the western edge of the Jafura sands along the Jaub at 660 feet was largely covered with igneous pebbles (porphyry, rhyolite, felsite and quartz) similar to those which I had collected on the Awariq flats at 2520 feet. It seems probable that they had been carried down here from the Yaman mountains.

[2] Philby disagrees with this and is convinced that the sands of Bani Ma'aradh separate the Jilida from Abu Bahr. It is however possible that there are gaps in these sands which he here describes as flattish.

[3] On previous journeys I noticed similar silt deposits throughout the course of the Mughshin wadis, deposited there by floods sixty and thirty years ago. (See *Geogr. J.* 108 (1946) 133.) There were also deep beds of silt in the Raidat al Sa'ar originating from the limestone plateau.

tufa broke up the valley floors, which were carpeted in places with fragments of black, grey, buff and off-white limestone.

Beyond the Jilida we travelled through the small scattered dunes of the Qaaima which ran on a bearing of 25° and whose steep slopes faced north-west, evidence that the prevailing winds were different here from those in the sands to the south of the Jilida. Then for three days we struggled across the mountainous sands of Bani Ma'aradh and Mujairi (Plate 3), thankful to climb 300 to 400 feet up on to the down-like summit of each successive range by its easier slope, for their northern faces fell away in unbroken walls. These great sand masses were a golden red in colour, and their highest peaks were built up around deep crescent-shaped hollows. The valleys, which were as much as 2 miles across, ran down from the 'Aradh and continued on a bearing of 60° until they disappeared from sight 20 miles and more to the east. Their floors were covered with a mosaic of highly polished limestone fragments and in places the rock was eroded away into low steps. "Samr," "hardhai" (*Acacia flava*), "rimth" (*Haloxylon salicornicum*), "'arad" (*Salsola cyclophylla*) and "darma" (*Fagonia* sp.), typical steppe and plateau vegetation, grew on the flats, while there was much "hadh" on the dunes, the first that we had seen on this journey. Some summer rain had fallen here, and "zahra" (*Tribulus* sp.), qasis, alji, "sa'dan" (*Neurada procumbens*),[1] "gaushi," "maluh," "halama" (*Lithospermum callosum*), "karia" (*Heliotropium* sp.) and "rahath" (*Malcolmia aegyptiaca*) had sprung up but were already withered except where they had been revived by the winter showers,[2] which had spread a green bloom of young seedlings upon the sand.

We now noticed the occasional tracks of wolves and once the stale spoor of an oryx, the first we had seen since leaving the Jilida, but we were far more concerned when we came upon the signs of camel herds some of which were but a week old, and especially troubled when we crossed the fresh tracks of two mounted Arabs travelling east. Any Badu, already on the alert owing to the recent raids, would identify us at once by sight or from our tracks as the hated Mishqas and would then give us no chance to explain ourselves. Had there been a moon we would have travelled by night and concealed ourselves by day, but it was impossible to do so in the dark through these enormous dunes. Two of us scouted continuously ahead, scanning with care each slope and hollow but always uncomfortably aware of the tell-tale tracks which we left behind us. In the evenings we grazed our camels in some basin of the sands, while we lay up to watch back along our tracks until it was dark. We then couched them beside us and slept with our rifles in our hands, springing to watchfulness whenever a camel stirred.

[1] In places these sands were strewn with tubular concretions of sandy limestone formed round fallen shoots from the abal bushes. Such areas appeared to favour especially the growth of sa'dan. In general, vegetation grows on the easy inclines (sidara) of the dunes where the sand is firm, or in the hard bottoms of the hollows (huqun). Zahra and qasis favour hard sand close under a steep soft slope. Halama, karia and rahath are only to be found in the western sands approximately north of 19° N. lat., and in the eastern sands north of 22° N. lat.; for example, in Dhafara.

[2] Vegetation growing from seed on winter rain takes two and a half to three months before it will provide grazing. It grows quicker in the summer but will only last a short time.

On Janaury 18 we came out of the sands, which for the past two days had been particularly difficult to cross, on to the 'Aradh plateau and camped in the sunken watercourse of the Bani Ghadhai.[1] The gently sloping gravel plain, scattered with limestone fragments, extended into the valleys between the successive ranges which sprang up from the plain in great massifs of sand 500 feet in height.[2] The western edge of the 'Aradh was out of sight. Beneath it were the three shallow wells of Zifr, and 30 miles to the north of them the deep brackish well of Qariya amid the ruins of the Sabaean city. Sadr told me that just south of the Khashm al 'Aradh lay the well mounds of Mankhali, believed by the Badu to be wells of the Bani 'Ad, whose lost city of Kinad bin 'Ad was reputed by them to be under the sands of Jaihman a day's journey to the south.[3] I had also asked many of the Sa'ar and Karab about the Bahr al Safi. They knew the name but only as that of a mythical quicksand somewhere in the far sands. They were emphatic that no such quicksand existed in any of the desert with which they were acquainted and I am now convinced that no quicksands such as von Wrede claims he visited in 1843 exist in the western Rub' al Khali, and that Bahr al Safi, if it is to be identified with anything, can only be Umm al Samin in the Oman steppes.[4]

For the next two days we travelled along the 'Aradh, sometimes near the escarpment edge, whence we could see far out over the sands of Bani Ramh to the distant peaks of Sanah, Dhibi, Wuhayid and Maraibikh, and at other times passing through the fringe of the sands. Then on January 20 we dropped into the stream bed of the Hanu, which runs east through the Qariya gap, and camped at 2250 feet. Next morning we reached a clearly defined track from Qariya, and as we drew near the Hassi well we rounded a corner and came unexpectedly on eight mounted Yam travelling to Najran. Our rifles were in our hands while theirs were packed under their saddles. We greeted them, saying that we came in peace,[5] but our meeting was tense with hostility. A boy among them asked, "Are they Mishqas?" and their leader answered contemptuously, "Don't you know the Arab? Don't you know the foe?" After they had gone on we camped beside the shallow well among the stony hills. Nearby was a small house where lived an elderly Dawsari, the guardian of the well. Luckily he was absent looking for a stray camel, so that Sadr and

[1] The "ghadha" (*Haloxylon persicum*) here reached 10 feet in height. This was the first place where we had encountered this graceful feathery bush. It is very common around Jabrin, and I found it as far east as Buraimi.

[2] These 500-feet dune massifs were the highest I saw in these western sands. I am myself convinced that the 'Uruq al Shiban, where some of the sand masses are 700 feet high, are the highest dunes in the Empty Quarter. Muhammad al Auf, my guide in 1946–47 who had travelled widely in the sands, confirmed that these were the highest of all the dunes. See "Across the Empty Quarter," *Geogr. J.* 111 (1948) 6.

[3] For Bani 'Ad, see essay on 'Ād in 'The encyclopaedia of Islām,' p. 121, Leyden and London, 1913; 'Quran,' sura 46; H. StJ. B. Philby, 'The heart of Arabia,' pp. 62, 100, 1922; *idem*, 'The Empty Quarter,' pp. 157 *et seq.*; Bertram Thomas, 'Arabia felix,' pp. 161 *et seq.* The Manahil, Rawashid and Mahra all believe that Ubar is in the southern sands of Shait, where many well-defined caravan tracks disappear into the sands.

[4] Adolph von Wrede, 'Reise in Hadhramaut,' Brunswick, 1870; see also *Geogr. J.* 111 (1948) 12.

[5] To indicate peaceful intentions, Badu shout, "Al afiya, al afiya" (Health).

Salih were able to slip away unnoticed after dark.[1] Their departure depressed us, for the comradeship of the past days had drawn us close together.

We were across the Empty Quarter; it was sixteen days since we had left Manwakh. We rested at the Hassi for a day and then travelled to Sulaiyil, an uninteresting mud village on the edge of palm groves and cultivation in the wadi Dawasir. The villagers were fanatical and churlish, while such Badu as were here frankly cursed their luck in not having found us out in the desert. Only the young Amir was friendly. He told me that nothing could have saved us if we had fallen in with Badu, all of whom were wrought up by the recent raids and counter raids.[2] He wired Ibn Saud, informing him than an Englishman had arrived across the sands from the Hadhramaut, and was ordered to detain him and imprison his Badu. Late that night the Amir of the wadi arrived, and after interrogating my companions, who refused to be browbeaten by the bullying of his slave clerk, he took me back with him to his castle at Dam. He allowed Bin Kabina to accompany me and, like the Amir of Sulaiyil, treated me throughout with kindness and consideration. Next morning a message arrived from the King that we were to be released and allowed to go on our way. I returned to Sulaiyil where my other three companions had spent an uncomfortable night in the stocks, and next day we left for Laila, for it was my intention to cross from there to the Trucial Coast by way of Jabrin. We followed the motor road through uninteresting country where there were neither Arabs nor grazing, and arrived at Laila in the Aflaj on February 5. Philby had come down by car from Riyadh to meet me, and I now heard that it was his intervention on my behalf which had secured our release. He was going on to Qariya [3] to look for inscriptions in that ruined city and was anxious to leave next day, so we talked till dawn while the rain fell steadily outside his tent.

We were short of food for our onward journey and remained in Laila to buy some, but soon regretted the necessity. The Amir Fahad and his townsmen were fanatical, boorish and unpleasant.[4] The Amir left us for twenty-four hours without a meal or coffee although we were his guests, and thwarted our efforts to procure a guide, while the townsmen reviled my Arabs for bringing a Christian to Laila and refused to allow them to enter their shops, loudly expressing their hopes that we would perish without a guide in the desert. We were glad to be gone from this inhospitable place, though short of food and without a guide. I told my companions that I could take them by the map across the 155 waterless miles to Jabrin and thence if necessary to the Sabkha Mutti, and to this they agreed. We left Laila on the

[1] Sadr and Salih intended to return by a route slightly to the east of the one we had just come by. We had spared their camels for the return journey. I later heard that they got back safely to Manwakh.

[2] I heard subsequently that two parties of Dahm, fifteen and twenty strong, set out from the Jauf to intercept us during our journey across the sands. The party of fifteen found our two-day-old tracks just south of the Jilida and followed them for a day, but then abandoned the pursuit, since they said we were going too fast for them to catch us.

[3] See p. 90 of this *Journal*.

[4] I had previously travelled widely in the Hijaz, 'Asir, Tihama and Najran with Ibn Saud's permission and accompanied by a representative of the local Amir, and had everywhere been well received. Here at Laila they gave vent to their latent fanaticism, knowing that we had come to these parts without the King's permission.

afternoon of February 7 and reached Jabrin on the 14th, after crossing the Dahna sands on the 12th. Except for this day in the Dahna we travelled across successive flint-strewn plains confined by low ridges and rocky hills which soon lamed our camels, accustomed as they were to the softness of the sands. Heavy winter rain had fallen to the north and we had hoped for some grazing on this route, but there was nothing here but dead "arfaj" shrubs (*Rhanterium epapposum*) and leafless bushes of "silm" (*Acacia flava*) and "gurdhai." Our camels had starved in the sands and in the drought-stricken waste between Sulaiyil and the Aflaj. There we had bought them lucerne, but they had only nibbled at it, deterred by its unaccustomed taste.

We watered at Umm al Adwa near the escarpment on the south-west side of the Jabrin depression, and remained there for twenty-four hours to rest ourselves and our camels, although there was nothing for them to eat but the dried-up bushes of "ghadhai" from which they turned away after a few mouthfuls. The following afternoon we struggled across the wet salt flats at the southern extremity of the depression, and camped in the hills of Burq al Samr, where there was a good view northwards over extensive palm groves.[1] Then, skirting the depression of Sabkha Khin, we crossed a wilderness of barren hills and gravel flats until we reached the Jaub on the 18th. This broad valley runs east through the Jafura sands and is confined in places by low limestone ridges. Here "shinan" (*Siedlitzia Rosmarinus*) and "harm" (*Zygophyllum* sp.) and al ittle "ghadhai" grew in the valley bottom, but there was no vegetation on the sands.[2]

For the past ten days clouds had banked up towards evening and there had been distant thunder and lightning. Now it rained nearly continuously for three days and intermittently for the next four, often with local thunderstorms especially at night. We had no tent or covering other than our cloaks and blankets, through which the driving rain soon penetrated, so that we were wet, cold and always hungry. I was becoming anxious about our water. We had nothing in which to catch the rain and nowhere could it collect in pools. I was confident that I could act as guide as far as the Sabkha Mutti, but ahead of us my map showed only the Dhiby well south of the Mijan escarpment. We had found one very brackish well in the Jaub and I recollected that the Badu had told me that all the water in this area was undrinkable. We were also desperately worried about our camels. Day after day there had been nothing for them to eat but salt bushes which scoured them so badly that finally we tied them up to keep them from them. Most of them had had saddle swellings from which the skin now sloughed to uncover deep, evil-smelling ulcers which might easily prove fatal in their weakened condition. On February 22 we reached the Dhiby well, which I found exactly where I had predicted, thereby establishing my reputation as a guide. But as I had anticipated, it was too brackish for anything but camels to drink. We now decided to cross the Sabkha Mutti near its head, for we feared that elsewhere our camels might become inextricably bogged in these extensive salt flats,

[1] For a description of Jabrin, see R. E. Cheesman, 'In unknown Arabia,' pp. 50 *et seq.*, 1926; H. StJ. B. Philby, 'The Empty Quarter,' pp. 86 *et seq.*

[2] In these sands there was practically no abal or hadh, usually a standby in these latitudes.

7. Sand massifs and salt flats south of Liwa

8. Oman mountains north of Buraimi

9. Sailing home from Africa to Kuwait

especially after the recent rains.[1] Two days later, when we were within a few miles of these salt flats, we happened upon an undulating ridge verdant with tufts of fresh spring qasis. This pasture was very local and had we been a mile or two on either side of our route we should have missed it. As it was, it saved our camels.

For five hours next day we crossed the Sabkha Mutti where it was divided into three arms by great crescent-patterned drifts of sterile white sand. The flats were crusted with dirty white salt which threw up a blinding glare into our faces. In many places our beasts broke through and floundered in the liquid black sandy mud, so that we feared that they might become helplessly entrapped. On reaching the far side we camped among the undulating white sands of Al Jazair, but they were utterly lifeless, even the "harm" bushes being dead and brittle after years of unbroken drought.[2] It was eleven days since we had left Jabrin and our camels were weak and our water short. We had none of us been in these sands, and my map could only be relied on for the position of Abu Dhabi, 215 miles along the coast. We finally decided to strike east into the Empty Quarter and look for the Liwa oasis, which I estimated was about 90 miles away. Bin Kabina and I had reached its southern edge from Dhufar the previous year and we hoped that, guided by the different characteristics of the surrounding sands and the information we had then acquired from the Arabs, we should be able to find Balagh well where we had watered on that occasion.

Next morning, after travelling for 12 miles across flat white sands, we reached the edge of Dhafara (Plate 1). Here was a succession of dune chains, each of which when approached from the west showed up in turn as a wavy silver-blue wall 3 to 4 feet high, running out of sight to the north and south along the top of an orange-red slope a mile wide.[3] To the east these dunes fell away abruptly in a jumble of hollows. They gradually became larger and more complicated and developed into high but uniform dune ranges and swelling downs, full of crescent-shaped hollows and deep pot-holes. The steeper sides of many of these hollows showed marks where water from the recent heavy rain had flowed down,[4] and everywhere the rain had formed a crust upon the sands which was pitted with holes made by hailstones. An earlier fall of rain in November had caused some qasis, birkan and zahra to re-shoot, and

[1] Two camels had been lost in the Abu Dhabi sabkha shortly before I arrived there. They had sunk in up to their knees and it had proved impossible to extricate them.

[2] The night we camped here there was a drenching dew; the wind was northerly. Later in the Taff, from Bidia to Abu Dhabi, there were drenching dews also with northerly winds. The Badu believe that dew scorches the vegetation.

[3] The coarse-grained sand is always considerably darker in colour than the fine sand. On the flats and hard slopes these coarser grains work to the top and account for the darker colouring. Even here however they lie on the surface in small ridges an inch or so apart, separated by troughs of the fine sand. On walls and steep faces among the dunes, having worked to the surface they are unable to remain there; consequently these areas are lighter coloured. The fine sand is also easily blown about and builds against bushes and in hollows. Light coloured sand indicates soft sand.

[4] In the bottoms of some of these hollows there were recently stratified deposits of friable limestone. In some cases 4 feet of deposit were exposed lying at an angle to the sands.

there were "abal" bushes in these sands and some hadh which the camels refused to eat now that it had shed its seeds.[1] Here we found tracks of ratels, fennecs and monitor lizards and saw a few hares.[2] Between Aflaj and the Dahna we had seen two or three gazelle, but otherwise during the past eighteen days we had noticed neither animals nor birds other than an occasional raven. I had found a raven's nest with four fresh eggs in a "ghadha" bush near the Dhiby. Whenever my Badu saw a single raven they shouted "Go and fetch your brother," and if it persisted in following us they shot at it; for a single raven brings ill luck.

On February 28 we chanced upon a filled-in well at the bottom of a deep hollow which we afterwards identified as Balisa; here the water is said to be at a depth of 20 feet and, like most of the Dhafara wells, fit only for camels. I later spent much time inquiring from the Badu the relative positions and the distances between the wells in Dhafara [3] in an attempt to adjust them with the positions for Khaba, Abu Katab and Al Qarra. The sands here are very fertile and, after rain, produce good pasturage of zahra, halama, karia, qasis, alji, sa'dan, birkan, as well as hadh and abal. They are grazed by the 'Awamir, Rawashid and Manahil and by a few of the Manasir, who mostly graze their camels on the permanent "harm" (*Zygophyllum* sp.) and shinan bushes on the salt flats in the Batin and Liwa.[4] From Balisa the great sand mountains of the Batin were visible and gave us a useful indication of our position. Next day we reached the shallow well of Ghadhai, where the water, though drinkable, was brackish. It was fifteen days since we had left Jabrin and we had perhaps two gallons of water left in our skins.

We arrived at Balagh on March 4 on a still, hot afternoon, and four times that day we heard the roaring of the sands.[5] The Dhafara downs were of

[1] The Badu call hadh "warith" when in flower (September–October), "jadir" when covered with white floss (November–January) and "silli" when it has cast its seed (January–September). Warith is better food for camels than jadir, while silli is practically valueless.

[2] I was surprised to see numerous tracks of hares on the sterile sand dunes around the Sabkha Mutti. "Dhub" (*Uromastix microlepis*) and "damusa" (*Scincus* sp.) are eaten by the Badu and I found their meat pleasant. "Rual" or "waral" (*Varanus* sp.) are eaten by the Bani Katab and other Oman tribes. The "abu qursh" (*Uromastix Thomasi*) is not, I think, eaten by any Arabs.

[3] Correctly, Dhafara is the name given to the sands between Kidan and Bainuna, lying to the west of Batin and Liwa. It is sometimes used, especially by the Manasir, Bani Yas and coastal Arabs, with a wider meaning to include Liwa, the Batin, Kidan and Qufa.

[4] Camels grazed on harm are called "hawarim." They are watered three or four times a day and are useless for journeys far from water. Manasir camels are well spoken of.

[5] The sands here consisted of dune masses 400 feet high. I heard the roaring at: (i) 2.30 p.m., still and hot with very slight west wind. We and our camels stationary at the well. Distant but loud roaring lasting three seconds, from steep south slope of big dune. (ii) 3.45 p.m., no wind. We were passing over a salt flat close under a steep dune face 40 feet high. Noticed the sand slipping from the top very slowly in streams. Roaring lasted three seconds. (iii) 4 p.m., distant roaring lasting two seconds. (iv) 5.20 p.m., just before sunset. Distant roaring from southern faces of big dunes. This roaring is a loud vibrant rubbing sound. See "Across the Empty Quarter," *Geogr. J.* 111 (1948) 9.

varying shades of red and there were no salt flats among them, but here in the Batin the sands were of a golden yellow tinted with green and blue. They rose up in mountain masses 400 to 500 feet above the white salt flats (Plate 7), which were surrounded by belts of harm, 'arad and shinan. Next day we found a small Manasir [1] encampment at the Umm al Qarain palm groves on the edge of Liwa, and we persuaded one of them to guide us to Abu Dhabi. We were told how, two months before, a raiding party 300 strong from Dibai had fallen upon and exterminated a Manasir encampment on the edge of the Hamra sands, killing fifty-two of them and losing five themselves. We also heard that the Manasir, 'Awamir and Rawashid were now gathered round Umm al Lishtan in Bainuna where there was rich grazing. Had we travelled direct to Abu Dhabi from the Sabkha Mutti we should have come on them. But I was glad that we had come to Balagh, which had enabled me to tie up my present traverse with the one which I had made the year before, and I could now visit Liwa, which had never yet been seen by a European.[2]

The Liwa settlements number about fifty-two and extend eastward in a rough line for 55 miles, from Idd on the edge of the Batin to Hamaim. Most of them are inhabited by the Bani Yas,[3] but the Manasir own the groves to the east of Tharwaniya which are however smaller and less important than those to the west. These Arabs live in rectangular cabins built of palm fronds and placed for the sake of coolness on the downs above the palm groves. Two or three cabins are usually enclosed by a high fence and inhabited by a family.

[1] Manasir sections are Al Bu Shar, Al Bu Mindhar, Al Bu Rahama, Al Bil Khail.

[2] I have read Raymond O'Shea's 'The sand kings of Oman' (1947) in which he claims to have visited Liwa and to have discovered "the lost city" of 'Ad 10 miles south of Qarra. Out of 197 pages he devotes 189 to more trivial matters and this important journey is dealt with in the remaining eight, a large part of which is taken up by quotations from Arab love songs and a chapter of the Quran; his description of "the lost city" itself is accorded no more than twelve lines. This summary treatment does not facilitate confirmation of his claim.

During the journey he notices a mantis, two small red spiders and the skeleton of an ibex, but in stating that he visited both Idd and Qutuf he makes no mention of the settlements and palm groves at these places. His description of Liwa as a desert is difficult to reconcile with the fifty-two settlements which exist there, whilst it is surprising to find no mention of the giant dunes and salt flats which are such characteristic features of this area. I was unable to recognize Buraimi on the edge of the desert from his description.

He describes "the lost city" itself as "a mass of rubble so that it was difficult to distinguish houses or streets" set in "a large bowl-shaped depression with gently sloping sides . . . the slopes profuse with vegetation." Whereas the photograph which carries the caption "the lost city" appears to show a number of modern white-washed buildings and grass huts built along a gorge between steep barren black hills. None of the Badu whom I questioned, nor the Trucial shaikhs, had heard of this journey, which is curious, since he apparently employed local Arabs, started from the Trucial coast, and travelled through the one region in the sands that has a permanent settled population. They did remember that he had once briefly visited Ras al Khaima by car, a distance of 45 miles from Sharja. Mr. O'Shea says in his preface that his book is a factual account of his experiences on the Trucial Oman coast of Arabia in 1944 and 1945, but he must produce more facts to substantiate the account of this journey before it can be accepted.

[3] Bani Yas sections are: Sudan, Al Bu Mahair, Rumaithat, Qubaisat, Rawashid, Hawamil, Qumzan, Mazaria', Muharaba, Khamara, Abu Hamair, Araifat, Dahailat, Marar, Abu Falasa (at Dibai).

Muzara and Qutuf are the largest of the settlements, most of which consist of ten to twenty enclosures. There is a fort built of gypsum at Qutuf and the ruins of one at Dhaufir, and there is said to be another at Idd. Palms are planted along the salt flats, close under the high steep-sided dunes and in hollows in the sands, and the groves are fenced in. Other fences are built along the dune tops to control the movement of the sand, which in a few places has partly buried some of the trees.[1] The palms are carefully spaced and evidently well tended and their dates are reputed to be of good quality. The water is fresh and found at depths of from 7 to 20 feet, the deepest wells providing the best water, but there is nowhere any cultivation other than that of the date palms, probably owing to the salt near the surface of the ground. The Liwa Arabs own some camels and a few donkeys and goats. They also keep salukis with which they course hares on the flats. Small caravans carrying dates visit the coast at Maghaira, Mirfa and Ridaim where they meet dhows from Abu Dhabi or Dibai, and many of the younger men go pearling in the summer. They all owe allegiance to the Abu Fallah shaikhs of Abu Dhabi. During the summer months many of the 'Awamir, Manahil, Rawashid and Manasir camp round the settlements and graze their herds at a distance either in Dhafara, Kidan or Rabadh.

No abal grows on these great pale dunes and at the time of our visit harm was the only grazing. We had therefore to press on if we were to reach Abu Dhabi before our camels collapsed. We skirted Qutuf, visited Dhaufir and Yaff and camped that night in the small grove of Al Ghatain. We were now on the edge of the Qufa, a string of fresh-water wells and small palm groves, which lies to the north of Liwa and runs parallel with it but which is said to contain no permanent settlements. The sands here were very different from those of Liwa. Instead of great mountainous masses enclosing long narrow salt flats, we now crossed light-coloured downs and valleys of hard sand running east-north-east to west-south-west. Set in the north-west sides of these valleys were crescent-shaped hollows whose walls were as much as 100 feet high, and exposed in their basins were grey mounds probably of gypsum. Hawaya well was in one such hollow. North of Qufa lay the Saruq, an undulating plain of hard red sand and small crescent dunes, and beyond this was the Taff. We watered at Bidia on March 10, having spent a quarrelsome and wretched twenty-four hours nearby in drenching rain. We reached the salt flats along the edge of the sea just west of the Salali promontory in the evening of March 11 and arrived at Abu Dhabi on the 14th.

I had intended to stay only a day or two in Abu Dhabi before leaving for Buraimi on the edge of the Oman mountains, but Shaikh Shakhbut and his brothers Hiza and Khalid were so friendly, hospitable and kind that we lingered here for twenty days, glad to relax in the comfort of their guest-house from the strain under which we had been living. While we were here we spent nine delightful days, accompanied by Hiza and Khalid, sailing among

[1] See "Across the Empty Quarter," *Geogr. J.* 111 (1948) 8. The big sands move very slowly. Wells in Ghanim, Dhafara, Qufa, etc. are dug close under the steep sides of sand massifs or in the hard floors of deep hollows and appear to remain for many years before being covered up. The movement of the sands throughout the Empty Quarter is to the south.

the islands to the west.[1] These I found accurately placed on the chart but often misnamed, and I have corrected the errors on my map.

We left Abu Dhabi on April 2 and, after crossing the Khatam sands, arrived on April 6 at Muwaiqih, one of the Buraimi settlements.[2] All but two of these settlements are ruled by the Abu Falah shaikhs of Abu Dhabi. Zaid, youngest brother of Shakhbut, is generally in charge there. He is a forceful personality and has considerable influence with the Badu of these parts. He emulates their way of life and spends most of his time hunting and travelling among them. The Abu Falah command considerable respect among the tribes. During their recent war against the richer Bin Maktum family of Dibai and the Bani Katab tribe, they could count on contingents from the Bani Yas, Manasir, Dhuwahir, Bu Shams, Na'im and Al Kathir to offset the mercenaries hired by their opponents.

I remained at Buraimi until the end of the month and was very pleased to find Bird of the Iraq Petroleum Company there on a lengthy visit. During this time I spent a week hunting on Jabal Hafit. It is a barren and precipitous hogsback mountain, rising sharply 4000 feet from the surrounding plain. I climbed it three times by different routes and always found the ascent arduous and exacting; in most places it would indeed be impracticable. Jabal Hafit is very barren with almost no soil on its limestone rock. There were a few small species of ficus and an occasional *Dodonaea viscosa* among the giant boulders tumbled in the ravine bottoms, and a little heliotrope, convolvulus and mignonette and some small plantains growing from cracks in the naked rock.[3] Wolves and hyenas lie up on the mountain, and some years ago it was visited by a leopard which took a toll of the Arab herds on the plain below. I noticed few birds other than the vultures wheeling over the precipices and an infrequent falcon; I saw no raven.

[1] "Rim" (*Gazella marica*) have survived on many of the islands and on the rocky headlands among the salt flats on the mainland. They are rare if not extinct in the Taff, Qufa, Dhafara and Rabadh. "Damani" (probably *Gazella saudia*) but not rim are found in the Khatam sands and near the Oman mountains. Sea cows (dugong) known as "bagar al bahr" are common in the straits of Al Bazam. The Arabs catch them in nets and there is a big demand for their meat and for their hides which are used to make sandals.

[2] The Arabs on the coast refer to the Buraimi settlements as Oman. Of these Muwaiqih, Mataradh, Al Ain, Jimi, Qattara and Hilli are under the Abu Falah; Hamasa belongs to the Bu Shams and Buraimi to the Naim.

[3] My plant collection on Jabal Hafit includes the following: *Morettia parviflora*, *Cleome glaucescens*, "sakad" *Polygala erioptera*, *Malva parviflora*, *Hibiscus micranthus*, "harshama" *Grewia erythraea*, *Zygophyllum simplex*, *Seetzenia orientalis*, *Monsonia heliotropoides*, *Haplophyllum tuberculatum*, *Argyrolobium roseum*, "dimdim" *Indigofera arabica*, *Tephrosia persica*, "hadhaira" *Tephrosia Apollinea*, "naqama" *Rhynchosia Schimperi*, "saadan" *Neurada procumbens*, *Oldenlandia retrosa*, *Gaillonia Aucheri*, *G. hymenostephana*, *Gymnarrhena micrantha*, *Rhanterium epapposum*, *Emilia sonchifolius*, *Iphiona scabra*, *Felicia abyssinica*, *Helichrysum* sp., *Centaurea* sp., *Phagnalon* sp., *Pluchea* sp., "aitara" *Glossonema edule*, "markh" *Periploca aphylla*, "miza" *Convolvulus microphyllus*, *C. vergatus* var. *subaphyllus*, "ausqa" *Lycium persicum*, *Rumex vesicarius*, *Blepharis persica*, *Plantago ovata*, *P. amplexicaulis*, *P. ciliata* var. *lanata*, "haiduan" *Boerhaavia elegans*, *Cometes surattensis*, *Sclerocephalus arabicus*, *Gymnocarpos decandus*, "ra" *Aerva javanica*, *Chenopodium murale*, "gidhgadh," *Salsola Bottae*, *S. leucophylla*, *Ficus palmata*, *Euphorbia granulata*, *Ephredra foliata*. All my plant collections are in the British Museum (Natural History).

I had already heard that "w'al" were to be found on this 5000-feet mountain and had supposed that they were ibex, but in Buraimi I was given a skull and horns which I identified as those of a male tahr. This animal (*Hemitragus Jayakari*) had been described by Oldfield Thomas from two skins and skulls purchased by Dr. Jayakar in Muscat in 1892. It had however never been seen alive by a European. It appears to be confined to the mountains of Oman, and on Jabal Hafit I found that it was not uncommon. There they lie up under shallow overhangs among the stark beetling cliffs, where they are difficult to locate or to approach. The Arabs who were with me shot two adult females, one of which was carrying a kid only a few days from birth.[1] They frequent the mountain top and at this season the males appear to live apart while the females are in small parties of two or three. They usually descend to drink at dawn from deep rock pools in the gorges along the foot of the mountain, but recent rain had made this unnecessary, for there were pools [2] everywhere. It appeared from their tracks that some of them came down from the high ground to graze.

I was anxious to collect specimens of the wild ass (farra) which the Arabs told me lived around Jabal Samaini. I therefore decided to travel to Sharja by that route. Zaid lent me a superb Batina camel for the journey (Plate 4) and sent four of his retainers with us because the Bani Katab, through whose territory we passed, were hostile to the Rawashid. The Batina camels are unmatched for speed and comfort by any other of the Arabian breeds, and Zaid told me that this camel and four others had recently covered the 95 miles between Buraimi and Abu Dhabi in under twelve hours.[3] They will not however stand up to incessant hard marches and lack of grazing; for such work the Duru camels are unsurpassed. We left Muwaiqih on May 1 and travelled along the edge of the sands below the mountains (Plate 8). There was rich grazing of zahra, karia, qnatab, halama, sa'dan, "qurna" (*Monsonia nivea*), alji and many other plants,[4] and tall shady "ghaf" trees (*Prosophis spicigera*)

[1] T. C. S. Morrison-Scott writes: "The much lighter (in weight) coats of your females as compared with the male of *Hemitragus jayakari* from the Jabal Akhdar range may merely be a sexual difference and what we need is a complete male from Jabal Hafit. The tahr from the latter may be different since it looks as though Jabal Hafit is separated by low-lying country from the Akhdar range. On the other hand they may well be the same tahr. The skull of your male and the type of *jayakari* (male) are a good match."

[2] Mosquitoes abounded both at the foot of the mountain and on the summit, and made the nights a torment.

[3] This fact was confirmed to me on different occasions by several Arabs. For comparison, Philby tells me that a camel won a race from Mecca to Jidda, a distance of 45 miles, in six hours. In the Sudan in summer I once rode 115 miles in twenty-three hours on a good Bishari, and from Jabal Meidob to Omdurman, a distance of 450 miles, in nine days. These Batina camels are fed on dates and lucerne, and a really good one would cost to-day 1500 rupees.

[4] My collection from the foot of the Oman mountains includes: "alji" *Dipterygium glaucum*, "rahadh" *Malcolmia aegyptiaca*, "qurliya" *Oehradenus baccatus*, "habaiya" *Malva parviflora*, "zahra al sih" or "qotaba" (local) *Tribulus megistropterus*, "raihana" *Psoralea plicata*, "halaiba" *Indigofera viscosa*, "ghaf" *Prosopis spicigera*, "sa'dan" *Neurada procumbens*, "saqi ghorab" *Gisekia pharmaceoides*, "birkan" *Limeum* sp., "ramram" *Heliotropium tuberculosum*, "fani" or kahal (local) *Arnebia hispidissima*, *Lithospermum callosum*, *Boerhaavia elegans*, *Bassia muricata*, *Pterogyrum scorparium*, "tunub" *Crozophora* sp., "anal" *Ephedra foliata*, "thamil" *Cynodon dactylon*.

under which we rested at noon. We found the "farra" on the small stony plain below Jabal Samaini, the only place where they are said to occur other than the wadi Halfain on the edge of the Wahiba country. I shot two of them. They have since proved to be feral, matching closely specimens of feral Socotra donkeys. Their skulls are smaller than those of the true wild asses (*Equus asinus*) which have no cross on the withers and have striped fetlocks.[1]

We arrived at Sharja on May 10. A week later I left Dibai by dhow for Bahrain while my companions returned to Buraimi to summer there among their fellow tribesmen. We had travelled 1500 miles since first we left the Hadhramaut. Often we had lived under considerable strain and nearly always we had been short of food and water. I had been drawn along a road of my own choosing by the lure of the unknown and had been rewarded by our achievements. My companions, by nature realists, might well have hung back at Manwakh or hesitated to continue without a guide from Laila. Had they refused, no other Badu would have accompanied me in their stead. I owed everything to their light-hearted gallantry, their constancy and endurance.

Topographical terms for features in the sands used by the Rawashid

'uruq	عروق	Long, high, parallel dune chains 200–400 feet high.
s. 'iriq	عرق	
khaiut	حيوط	Parallel sand ridges similar to " 'uruq " but smaller,
s. khait	خيط	sometimes only a few feet high.
q'aida	قعيدة	Sand massif 300–700 feet high, sometimes rising out
p. q'aid	قعايد	of an " 'iriq," more usually detached.
tar'auza	طرعوزة	Dominant "q'aida" rising to a single peak.
shinsub	شنسوب	Sand peak, either large or small.
hazam	حزم	Rocky mound on ridge exposed in the sands.
mashbak	مشبك	Saddle between two adjoining "q'aid."
kharaim	خرايم	Gravel gap between an " 'iriq " and a "q'aida."
rithima	رثمة	North-east end of an " 'iriq " (the dunes run north-
		east to south-west).
bitara	بترة	South-west end of an " 'iriq."
umfardat	مفردات	Isolated dunes on gravel plain.
sinin	سنين	Razor edge along the top of an " 'iriq " or "khait."
falakha	فلخة	Hollow running along the top of an " 'iriq."
hajar	حجر	Sand block in "falakha."
khab	خب	Hollow running down a "q'aida."
p. khabub	خبوب	
shiquq	شقوق	Flats between " 'uruq," sometimes a mile or more
s. shiq	شق	across and consisting of hard sand gravel or salt
		crusts.

[1] No true wild ass is known from Arabia, but an onager (*Equus hemippus*) has been recorded from Syria and Mesopotamia. This onager was first described by Geoffrey St. Hilaire in 1855. Two specimens are in the study collections of the British Museum (Natural History).

sahil	سحيل	Side of a dune where the sand is lying at the steepest possible angle. Sand is soft and light coloured.
safiq	صافق	Slope easier than a "sahil" but still too steep for camels to climb. Sand is soft and light coloured.
sidara	سدارة	Gentle slope of firm sand on the side of an " 'iriq,"
radfa	ردفة	"khait" or "q'aida." Darker coloured than the "safiq" or "sahil" on the opposite side of the dune.
qasama	قصمة	High ground easy of ascent and devoid of special
hadaba	حدبة	features.
dakaka	دكاكة	Undulating ground consisting largely of hard packed sand.
rabadh	رباض	Area of crescent-shaped dunes each of approximately the same size and height.
huquna	حقنة	Crescent-shaped hollow either in "rabadh," or set in the side of a dune when its walls may be 100 feet high or more, or forming a deep pot-hole in downs.
saum	سوم	Mound of loose sand piled by wind against bush, etc.
sabkha	صبخة	Salt flats or occasionally gypsum flats, commonly
p. sabakh	صباخ	occurring between " 'uruq " or "q'aid" in the
masabikh	مصابيخ	central and eastern sands.
sahma	سحمة	Gravel flat among sands.
hamsha	حمشة	Dark coloured gravel flat scattered with small stones.
hithlim	حثلم	Brown coloured pieces of gypsum.
hamarur	حمرور	Red or deep golden coloured sands. The Badu classify the sands as "Hamarur" or "Baidha."
baiadha	بياضة	White, buff or pale gold sands.
nukda	نكدة	Branch of a wadi emptying into the sands.
qu'a	قوع	End of a wadi where it empties into the sands.
khaur	خور	Shallow brackish well. Water sometimes drinkable
p. khiran	خيران	by the Arabs, sometimes too brackish even for camels.
nabat	نبت	Fresh shoots springing from seeds after rain.
zaraiqa	زريقة	Year-old tribulus (zahra) sprung from seed.
'athwa	عثوة	Pasturage which has been revived by rain and from which new shoots have sprung.
ra'i mara'i	رعى مرعى	Pasturage for camels.
akal	اكال	
'ushab	عشب	
filu	فلو	Pasturage on which camels are actually being grazed.
khat	خط	Long, narrow but restricted belt of fresh pasturage.
ruq'a	رقعة	Roughly square or rectangular area of fresh pasturage.

The preceding paper was read at the Evening Meeting of the Society on 4 October 1948.

Before the paper the PRESIDENT (Sir HARRY LINDSAY) said: Last year Mr. Thesiger described to us his first crossing of the Rub' al Khali desert in Arabia in 1945–46, and to-night he is going to describe his crossing in 1947–48. I may add that this month he will be leaving England for his third crossing of the Arabian desert. These crossings have had as their object new knowledge about a little-known part of Arabia and more information as to minerals, fauna, flora and so on. In making these journeys Mr. Thesiger is continuing the work he previously did in the Middle East. There he won his D.S.O. for his activities with the Special Service groups. After the war he joined the Middle East Anti-Locust Unit, and some of his earlier explorations in Arabia were carried out in the course of his work for that institution. In the summer of this year Mr. Thesiger was awarded the Founder's Medal of the Society for his Arabian explorations.

Before calling on Mr. Thesiger, may I remind you that this is the twelfth Asia Lecture. The Asia Lecture was instituted in 1924 through the Dickson Foundation and the first lecture was given by Sir Aurel Stein. The lecture is given every two years at the first meeting of the new Session.

Mr. Thesiger then read his paper.

The PRESIDENT: We have several distinguished visitors here to-night, but first may I say how much we all deplore the absence of His Excellency the Saudi Arabian Ambassador, Shaikh Hafiz Wahba, who is in Paris attending the United Nations Assembly. M. Shaher al Samman, Chargé d'Affaires at the Saudi Arabian Embassy, is taking the place of His Excellency. I would in the ordinary course have invited him to take part in the discussion but he has asked me not to do so because he has only been three weeks in London and feels that his English would not see him through. However, we have Colonel Cheesman with us, an old Arabian traveller and the first European to visit the Jabrin oasis.

Colonel R. E. CHEESMAN: I speak as one who knew Arabia a quarter of a century ago and you can imagine that in those days the central desert of Arabia was a different proposition to the Arabia of to-day. When I got to Jabrin the whole of the south was a complete blank. I was interested to-night to hear of the Sa'ar because I lived with the Mahra, a northern tribe, and when I tried to find out about the tribes to the south and mentioned the Sa'ar I was always told that they were very bad men, and that was all I could get to know about them. Where their actual area was I could not ascertain. Therefore this lecture has been especially interesting to me, because I now know a good deal about the Sa'ar. Thanks to Bertram Thomas, Philby and our present lecturer, the unveiling of Arabia has reached a stage at which there is little of the veil left to lift.

I conclude with a word of praise for our lecturer. I take great pride in him because I stood on the steps of the Addis Ababa Legation in the year of the Coronation when he was a guest and a very young man. He then said to me: "I want to do some exploring. Is there anywhere I could go?" I told him he was rather late in the field; that areas round the North Pole and the South Pole were all that had been left. He said he was not interested in cold countries. I then reminded him that there was a nice hot spot down in the Danakil desert and that nobody had explored it to find out where the Awash river went to. He said very little, but in a year or eighteen months he had crossed that desert and told us all we wanted to know about it. I next heard of him in the Tibesti

mountains, again on camels. In that regard I have a bone to pick with him. He found some fish in a pool in the Tibesti mountains and up to now I have never heard what fish they were. In any case, it was extraordinary to find fish there. I next heard of Mr. Thesiger in the Sudan. I was in the office of the Khartoum Ethiopian Bureau and he came with the idea of joining Colonel Sandford who was running a commando in the middle of Abyssinia. All we could do was to refer Mr. Thesiger to Movement Control. Each day he appeared round the corner of my house and asked "Any news?" I had no news to give him. Then one day I saw him no more and later I heard of him with Colonel Sandford. Somehow he had got a camel and had gone over the mountains and down the dale to the middle of Abyssinia. Whether Movement Control is still trying to arrange that journey, I do not know! In any case Thesiger reached his objective, with the result that there was a wonderful capture at Ajibar of an Italian army by a handful of English, Ethiopian and Sudanese troops. Thesiger had been given instructions by Wingate to stop that army getting over a defile across the mountains. He stopped them and the whole lot surrendered. It was a wonderful story which has not yet been told. Thesiger well deserved the D.S.O.

I congratulate him on the work he has done and am glad to hear that he saw the tahr, which was first reported by Dr. Jayakar a great many years ago when he sent skins to England where they were identified, so that we have, for the first time, corroboration of Dr. Jayakar's skins.

The PRESIDENT: It remains for me to thank Mr. Thesiger on your behalf for his lecture this evening.

H. J. MACKINDER AND THE NEW GEOGRAPHY

J. F. UNSTEAD

THE FOUNDATIONS OF the "New Geography" in Britain were laid in the latter part of the nineteenth century by a group of men among whom Sir Halford Mackinder was the most outstanding figure. This essay is an attempt to assess the part played in the work by Mackinder, and to throw some light upon the factors which enabled him to accomplish so much in a relatively short time in contrast with the small measure of success achieved by his predecessors in earlier decades. The inquiry is based largely upon publications of the Royal Geographical Society, supplemented by my own experiences during the years about the turn of the century and my personal knowledge of Mackinder and his co-workers, especially Sir John Scott Keltie and Professor A. J. Herbertson.

The turning point in the fortunes of Geography came in 1884. But to understand the contributory factors it is necessary first to indicate the elements in the situation before that date.[1] Of fundamental importance was the lack of unification in the content and the treatment of the subject. To a predominant extent it was a mere collocation of facts about the earth's surface and the peoples of the world without more than occasional reference to their inter-relations. Moreover, in actual practice there was not one Geography but two Geographies almost entirely separate: Physical Geography on the one side and Political Geography on the other. The former was based partly upon Astronomy, which had already contributed "the use of the globes" to the education of young ladies, and partly upon Geology, the geologists having in their hands instruction in physical geography where this went further than the bare definitions and lists of physical features of the earth to which it was customarily limited. Political, or as it was sometimes termed General, Geography consisted of facts about countries and capitals, peoples and productions with little relation to one another and practically none to the physical conditions of the earth's surface. There were occasionally writers who attempted some connection between parts of the two Geographies, and in some cases their work was derived directly or indirectly from the classic German geographers. But either this bridging was done piecemeal and remained incomplete, or the idea of a unity in Geography was expressed merely in a brief and theoretical form and lacked effective application.

In the Universities practically no place was given to instruction in Geography as an independent subject because it was regarded as not possessing either content or method worthy of serious study. The common view was that expressed by Professor G. H. Darwin at Cambridge: "I cannot see how Geography pure and simple can be made a subject of intellectual training." Special exception however must be made for the teaching of a series of

[1] For this period my main source has been the 'Report of the proceedings of the Society in reference to the improvement of geographical education,' 1886.

Oxford historians; and the publication in 1884 of the 'Short geography of the British Islands' by John Richard Green and Alice Stopford Green brought into focus the relatively frequent association made by this group between man's environment and his history.

One may perhaps be tempted to criticize the general attitude of the university authorities; but one must regard them as justified unless they could be expected to have possessed more insight, and foresight, into the possibilities of the coming science than all but a very few geographers. In fact, a vicious circle was involved. Because Geography was not considered worthy of academic study, facilities for teaching and research could not be granted, yet until these facilities were granted Geography had no opportunity to advance and to merit recognition. A similar position existed in regard to the supply of skilled teachers of Geography. Dr. A. Geikie, then Director of the Geological Survey, who realized limited possibilities in the subject itself, could envisage in Universities only a "special lectureship . . . the lectures and general teaching being arranged in concert with the Professor of Geology . . . the post might be filled by a succession of enthusiastic young lecturers" —obviously drawn from the ranks of the geologists. Here was a second vicious circle: no skilled teachers of Geography, therefore no training; no training in Geography, therefore no skilled teachers.

In the Public and "Middle" schools the attitude towards the subject was similar. Only a few teachers realized that it could have educational value; hence it was commonly ignored save where geographical facts were thought to be worthy of learning by rote, or where it was regarded as a useful handmaid to the respected studies of History or Classics. Here there appeared a third vicious circle: schools whose pupils went to the Universities could not afford time and money for a subject which the latter did not recognize; the Universities could not afford money for a subject for which the schools did not supply adequately prepared students and did not demand trained teachers. In Elementary Schools however "recognition" was granted to Geography by the New Code; a course from Standards I to VII was prescribed for the pupils, and the Teachers' Training Colleges also had prescribed syllabuses. Yet these were limited to the old and unrelated sets of facts and the teachers were trained in methods which had as little educational value as the subject-matter itself.

Such was the situation early in 1884; but it was rapidly and radically transformed by two parallel developments which took place independently at that time but coalesced within three years. These two movements were centred upon London and Oxford respectively; the former within the Council of the Royal Geographical Society, the latter in the person of Halford John Mackinder.

A few progressive members of the Council of the R.G.S. had from time to time attempted to improve the position of Geography in the Public Schools. Among these "educationalists" Francis Galton, a leader in several branches of thought, had taken a noteworthy place. Early in the 'seventies he had induced the R.G.S. to give medals to Public School scholars for proficiency in physical geography and in political geography, but gradually the scheme failed to attract entrants save in a very few cases where there were exceptionally

John Scott Keltie, Secretary R.G.S., 1892–1915

enthusiastic masters, and similar results followed the allocation of prizes to Teachers' Training Colleges. In the 'seventies attempts had also been made by the Council to enlist the help of the Universities by sending memorials to Oxford and Cambridge, but without result.

In the campaign of 1884 Galton had a most willing and active colleague in Douglas Freshfield; and H. W. Bates, earlier the 'Naturalist on the river Amazons' and then the Assistant (*i.e.* full time and salaried) Secretary of the Society, was sympathetic to the movement.

It is difficult to know what were the particular views of members of this educationalist group. Those who drafted the memorial sent to the Universities in 1874 had used the phrases [1]: "Geography implies a compendious description of all the prominent conditions of a country as well as its human inhabitants. . . . Each locality has its characteristic features, which it is the province of the geographer to describe with the utmost possible clearness. . . . Scientific geography concerns itself with the actions of concurrent phenomena upon one another in the same locality, showing why they tend to stability, and to give to each country its characteristic aspect. . . . Another of the problems is concerned with the reciprocal influence of man and his surroundings. . . . This mutual relation of the objects of the different sciences is the subject of a science in itself, so that scientific geography may be defined as the study of local correlations."

These ideas failed to gain acceptance by the university authorities. Even Galton, about a dozen years later, insisted that his view was a much more limited one [2]: "the art of geography was to give a vivid and connected account of the more interesting characteristics of specified districts. . . . He did not himself think so much as others of the possibilities of geography as a science; it was well to have a high project, but when they endeavoured to reason out for themselves the characteristics of a country, they found that at the present time they knew very little about the interactions of the various forces of nature." Freshfield has recorded [3] that in the discussions in 1884 Galton was more critical than constructive and that the Council was sharply divided, one section taking a strong stand that the business of the Society was still with exploration and not education. Freshfield summed up the situation in the sentence: "It was a counsel of prudence on the part of the Educationalists . . . to postpone discussion until they had had the time to strengthen their case by obtaining evidence of what was being done on the Continent and particularly in Germany."

In the end, Freshfield induced the Council to advertise for an "Inspector" to ascertain by correspondence or by visits the extent, nature and methods of geographical education and the attitudes of teachers and Universities towards it, in the United Kingdom and a number of the countries of the continent of Europe, and to obtain similar information by correspondence with people in the United States of America; the Inspector would also be required to collect specimens of the best text-books, maps, globes and other apparatus used in teaching, and to arrange and classify these for the information of the Council;

[1] R.G.S. 'Report,' p. 81.
[2] *Proc. R.G.S.* (N.S.) 9 (1887) 165.
[3] *Geogr. J* 69 (1927) 285.

finally, he should prepare a report embodying the steps that he would recommend the Council to take in order to improve and extend geographical teaching in the United Kingdom.

The appointment was secured by John Scott Keltie, who had been with Messrs. Macmillan as sub-editor of *Nature* and editor of the *Statesman's Year Book*. Within a year, in 1885, Keltie had travelled widely at home and abroad and presented his masterly "Report to the Council." [1] This became the turning point in British geographical education. The facts which he exposed regarding the position in the United Kingdom were those summarized above and were fully documented by correspondence, copies of curricula, syllabuses, examination papers and so forth. Conditions abroad were set forth in a similar manner and in practically every particular they showed obvious contrasts with those existing in this country; the backwardness of Britain appeared specially striking when Germany was considered, for there a long and honoured tradition had been the source of continued advances. Although Keltie did not formulate the vicious circles indicated above as checking reform in Britain, his testimony showed that in the countries where education in Geography had proceeded farthest none of these barriers existed and the way to greater advance was open. The documentary evidence in the report was reinforced by a collection of over 500 books, wall maps and apparatus used in Britain and abroad. The facts with their clear implications could not be disputed; the British neglect of Geography stood condemned.

Keltie recommended to the Council that action should be taken over the whole field. He advised that the Universities should be approached with a programme for the adequate recognition of Geography as a study both in itself and in relation to other branches of knowledge. He advocated the establishment of a readership or chair, and suggested to the Council that "if a competent man should be found, a man of adequate knowledge and sound well-balanced judgment, opportunity might be taken of giving some clear ideas of what geographers would propose to include in the field of their science."

He pointed out that steps by the Universities would have a powerful influence on the higher schools. He stated too that in the schools the two great weaknesses were the want of organization in the programmes, for which he advocated cooperation with the Universities Schools Examination Boards, and the want of knowledge in the teachers. To remedy this he suggested cooperation with "practical teachers interested in geography" and the provision of "short courses of special lectures on the educational field and methods of geography which might arouse a desire for improvement among teachers themselves."

This masterly report convinced the hesitant, and in part hostile, Council that action should be taken. A series of resolutions was passed enabling the President again to address the Vice-Chancellors of Oxford and Cambridge and now to show "the importance of providing for a representation of Geography in our Universities similar to that which it possesses in the leading Universities of the Continent, especially Germany"; *inter alia*, schemes were

[1] R.G.S. 'Report,' pp. 1–158; also published in *R.G.S. Supplementary Papers* 1 (1882–85) 439–594.

submitted for the appointment of a Reader or lecturer with financial assistance from the R.G.S. and for subsidies for founding annual University Exhibitions (value £100) for geographical investigations of approved districts. Another of the moves made by the Council was to form the collection of geographical appliances into an exhibition arranged to bring out national contrasts in each type of work. The exhibition was open to the public in London during the winter of 1885–86 and on four occasions lectures were given in connection with it. Two of these were specially remarkable for their clear understanding and statement of the inherent value and possibilities of Geography; one by James Bryce on "Geography in its relation to History," the other by Keltie "On appliances used in teaching Geography." [1] Subsequently the exhibition was shown in Manchester and Edinburgh, and Keltie lectured on what he termed his "Voyage of discovery amongst the educational institutions of Europe."

Keltie's London lecture, given on 22 December 1885, is significant for the purpose of this inquiry because in it he indicated what he regarded as the aim of Geography in education. "We want the pupil to realize as vividly as possible the actual appearance of the various regions and countries of our globe, their physical aspects, their outward characteristics, the vegetation which clothes them, the animals which roam over them, the people who dwell therein, the climate which dominates all. More than that, the pupil ought to be trained to trace out the interaction of the various features upon each other, and most important and instructive of all, the action and interaction between man and his geographical surroundings, the struggle between him and the forces of nature." This passage implies the unity of geographical study, to which a corollary is its teaching as an independent subject; hence, in view of the practical necessities of the time, he appends an argument for its academic freedom from the geologists. "I am tempted here to remark on the very important conception which prevails among professors of geology as to the field of geography; they seem to think that when they have made a few cross-country sections, mapped the out-crop of rocks, noted the action of water, and rain, and atmosphere, catalogued the animals and plants of the recent period, they have done with geography. That is only the beginning of the subject, the basis on which the varied superstructure has to be reared. . . . This is not the conception of the wide and varied subject which prevails in countries where geography is treated as a serious study worthy of professors in Universities, and of carefully regulated programmes in all classes of schools."

Yet although the Council of the R.G.S. had by now resumed its campaign for the improved status and the granting of facilities for Geography in education, although Keltie's documented evidence for the need of reform had been published, and although the case had been put forward publicly in connection with the lectures, the conversion of the university authorities (now the key-stone of the situation) seemed as far off as ever. In the discussion following the last lecture of the series, Professor McKenny Hughes gave no hope of change at Cambridge, and Freshfield, who had been in touch with the friendly group of Oxford historians, reported that he had their authority for saying

[1] Both published in R.G.S. 'Report,' pp. 182–203, 204–24.

that "At Oxford, instead of the University going the right way as fast as it could, it was resolutely refusing to stir at all. What was wanted at the Universities was a representative of Geography who would secure a hearing by his wide knowledge and power of making the subject attractive." This was the impasse reached in the early part of 1886.

Meanwhile at Oxford Mackinder was beginning his campaign. Born in 1861, he entered the University in 1880 and took a "first" in the Honours School of Natural Science in 1883, adding Modern History in the following year. Thus in the critical year 1884, at the age of twenty-three, he had just completed his undergraduate studies, and there is no doubt that these had been deliberately selected by him for the systematic prosecution of Geography—his greatest interest throughout his school days. Throughout his Oxford course, Mackinder was keenly interested in politics, and his gift of clear, incisive and forceful speech, possibly aided by the ability to show a combative spirit when occasion seemed to require, was a factor in his election as President of the Union. But if Mackinder had in him something of the warrior, he was also something of a missionary; and after taking his degree he became interested in the movement for adult education and gave Extension Lectures at a number of centres in the West and North of England. Not unnaturally, his subject was the New Geography. Thus at a relatively early age Mackinder showed the interests and aptitudes which made possible the strikingly rapid advance of Geography which almost immediately ensued. Long afterwards he told me how this came about.

In the Christmas vacation of 1885–86, he was in London and happened to see a notice outside a building announcing an exhibition of geographical appliances; he went in and there met Keltie. They talked together, and Mackinder said this chance meeting determined the future course of his life. (Yet a meeting, with the subsequent association of these two men already engaged in the same enterprise, would appear to have been inevitable.) To Keltie, Mackinder must have seemed his hypothetical "competent man" needed to give the Universities "some clear ideas of what geographers would propose to include in the field of their science." Keltie reported his find and Mackinder was asked to write down what he meant by his New Geography. In response he prepared a paper which was referred to Clements Markham, who reported back to the Council: "I am inclined to anticipate that the reading and consideration of this paper will form an era in the history of our Society." Inquiries had also been made by the R.G.S. about the lectures to teachers and to working-men which Mackinder had given in Manchester and elsewhere during the preceding winter, and the accounts received from the organizers and audiences left no doubt as to their success. The Council was convinced that Mackinder satisfied Freshfield's almost despairing requirement of a representative of Geography who would secure a hearing by his wide knowledge and power of making the subject attractive, and the paper was accordingly read at a meeting of the Society on 31 January 1887.

Mackinder's paper "On the scope and methods of Geography" [1]—with his clear statement on the essential nature, value and treatment of the subject, its relations to other branches of knowledge and its place in education—still

[1] *Proc. R.G.S.* (N.S.) 9 (1887) 141–74.

merits reading as a classic document in the history of the development of British Geography, and it may have a bearing even on the position to-day. For the purpose of the present inquiry, only his leading contentions can be indicated.

He defines Geography as "the subject whose main function is to trace the interaction of man in society and so much of his environment as varies locally. Before the interaction can be considered, the elements which are to interact must be analysed. One of these elements is, I hold, the function of Physical Geography. . . . We have here a bone of contention between the geographers and the geologists. . . . The true distinction . . . seems to me to lie in this: the geologists look into the present that they may interpret the past; the geographer looks into the past that he may interpret the present. . . . The other element is man in society. The analysis of this may be best considered on the lines of Bagehot's 'Physics and Politics.' The communities of men should be looked upon as units in the struggle for existence, more or less favoured by their several environments." A little later in the lecture Mackinder elaborated, and I think illuminated, the two terms Environment and Community: "An environment is a natural region. The smaller the area included the greater tends to be the number of conditions uniform throughout the area. Thus we have environments of different orders whose extension and intension, to borrow a logical phrase, vary inversely. So with communities. A community is a group of men having certain characteristics in common. The smaller the community the greater tends to be the number of common characteristics. Communities are of different orders—races, nations, provinces, towns—the last two expressions used in the sense of corporate groups of men. By the use of these two terms precision can be given to such discussions as the effects of exposing two communities to one environment, and one community to two environments. For instance, this—How have geographical conditions differentiated the English race in the three environments, Britain, America and Australia?"

Another facet of Mackinder's view of the function of Geography was expressed thus: "Knowledge is, after all, one, but the extreme specialism of the present day seems to hide the fact from a certain class of minds. The more we specialize, the more room and the more necessity is there for students whose constant aim it shall be to bring out the relations of special subjects. One of the greatest of all gaps lies between the natural sciences and the study of humanity. It is the duty of the geographer to build one bridge over an abyss which in the opinion of many is upsetting the equilibrium of our culture." Following upon this idea, he emphasizes the limits of Geography and warns geographers against trespassing upon the proper and peculiar fields of the special natural sciences and human studies.

The above quotations are but a few key-phrases and key-sentences from the lecture. As Mackinder was an excellent teacher, he gave precision and reality to his generalizations by many specific examples and summarized his views in two relatively detailed expositions of what he meant by his New Geography, illustrated by specially prepared maps.

Reading between the lines of Mackinder's paper, one can perceive that his mind had already gone far beyond the studies in Natural Science and History

which he had pursued for his degree. The influence of the great German geographers is clearly to be seen, but there is no uncritical acceptance of their teaching or their methods; for instance, in defining the proper field of Geography he said: "Even the great Peschel includes in his 'Physische Erdkunde' a discussion on the barometer and a demonstration of the formulae needed in barometric corrections. Such digressions are the cause of the often repeated charge that geographers are merely dabblers in all the sciences." The width of Mackinder's outlook is shown in various phrases which, though concise, are pregnant with suggestions; for instance: "Man alters his environment, and the action of that environment on his posterity is changed in consequence. The relative importance of physical features varies from age to age according to the state of knowledge and of material civilization." Throughout, the paper exhibits a maturity remarkable in a young man of twenty-five years as well as an essential feature of Mackinder's thought, namely, the power of integrating ideas—surely a creative process. He was one of those who "saw life steadily and saw it whole."

The lecture had a mixed reception when it was discussed a fortnight after its delivery, for naturally Mackinder's ideas were in advance of those of his audience; but its circulation before reading had already had a decisive result. Negotiations had been opened between representatives of the R.G.S. and the University of Oxford. The latter was now willing to establish a Readership in Geography, financed jointly by the two bodies, and within a few weeks it was announced that Mackinder had been appointed to the post. He gave his first lecture at Oxford in 1887 and soon had audiences of hundreds, including both lecturers and students. At last the way was opened to the recognition of Geography in higher education in Britain. Cambridge, without the stimulus of a group of sympathetic historians and the demonstration of a graduate already a geographer, did not respond as promptly as Oxford had done, but a lectureship was instituted about two years later. The first holders however lacked the ability of a Mackinder and it was not until 1898 that the new venture achieved the status of a Readership, again with a subsidy from the R.G.S. Smaller financial grants were also given to Manchester, Edinburgh and Wales as opportunity offered or required before this form of aid to the Universities became unnecessary. Other assistance, and repeated tokens of goodwill, by the R.G.S. and its officers were given to the cause of Geography in education. Here it may be specially noted that the appointment of Keltie to the Secretaryship of the Society enabled him to remain a powerful though unobtrusive factor in the growth of academic Geography during the still critical years around the turn of the century.

For over twenty years from 1887 Mackinder devoted his energies mainly to academic work in which the development of geographical teaching claimed a large part, though not all, of his interest. At Oxford, his lectures had a growing influence on students of other subjects, while he attracted an increasing number to follow either a group of special courses in Geography for which the University granted a Certificate, or a fuller training for which a Diploma was issued. During this time he became the first Principal at Reading, where he obtained for Geography the status of an independent Department. When the London School of Economics was founded near the end of the century, he

was instrumental in securing for Geography a place in its curriculum and he became a regular lecturer, later Reader and finally Professor, in the University of London. For several years he held concurrently Readerships at Oxford and London, travelling constantly to one or other city from his teaching and administrative duties at Reading.

From the point of view of the present study, the greatest advance during this period was made at Oxford where in 1899 Mackinder succeeded in instituting the School of Geography. In this matter he exhibited two characteristics specially important in his influence on the rise of Geography: one was his ability and drive in publicly and privately organizing opinion for practical action; the other was his selection and recruitment of younger men first to assist and later to extend the work he had initiated. The formation of the School of Geography was completed just in time to enable him to induce A. J. Herbertson to refuse a chair in the United States and to become his principal assistant at Oxford. In the next few years the School grew into a centre from which a great number of young men and women, inspired with new ideals and trained in new methods, went out to spread the teaching through Britain. At Oxford, lectures and discussion in the classroom were supplemented by a growing technique in varied forms of practical work in the map-room and in the field. Vacation courses brought other teachers, many of an older generation, within the scope of the new movement and thus contributed further stimulus and assistance to the rapid change already to be seen in schools. Meanwhile however other duties had drawn increasingly on Mackinder's energies and in 1905 he resigned his Oxford work to Herbertson.

In 1904 Mackinder had become Director of the London School of Economics, a post which he occupied for four years, and during this period and for some years afterwards he played an important part in the long process of inducing the University of London to recognize Geography in the curricula for degrees. After its inclusion only at the Intermediate stage in the Faculty of Economics in 1902, negotiations had to be carried out and objections had constantly to be overcome at every successive stage both in the Faculty of Arts and in that of Science. Indeed, recognition of Geography at the University was not fully effective until 1926. By this time Mackinder had long ceased from active participation in this struggle although he did not resign his London chair until 1925.

Several aspects of Mackinder's influence on British Geography were more indirect than direct in their operation, but they were widespread and of cumulative effect. Among them was his part in the formation and development of the Geographical Association. In 1893 B. B. Dickinson of Rugby, a pioneer in the improvement of teaching Geography, had a plan for forming a small association of colleagues to cooperate in obtaining and exchanging lantern slides for use in Public Schools. For this purpose about a dozen teachers met and Mackinder took the chair; one might almost say that he took charge of the meeting, for even its immediate outcome was wider than its conveners anticipated. In Dickinson's words [1]: "Mr. Mackinder, with his well-known directness, summed up the discussion and proposed the formation of an *Association for the improvement of the status and teaching of Geography*."

[1] *Geography* 16 (1931) 1.

This is not the place to trace further the history of the "G.A." except to add that for many years Mackinder as chairman of its Committee (later Council) wisely and energetically guided its deliberations and thus assisted its multifarious and fruitful activities. Another indirect outcome of Mackinder's work occurred in the first decade of this century when the lead given at Oxford and Cambridge was followed by other Universities which instituted lectureships (afterwards chairs) in Geography; a few of the earliest of these posts were filled by "disciples" who owed to him both inspiration and the opportunity to give it expression.

Mackinder's most far-reaching influence was probably that of his writings published in the years when he had attained full maturity and was still mainly concerned in academic work. The greatest of these was 'Britain and the British Seas' issued in 1902. It is now regarded as one of the classics of geographical literature and its appearance was an unmistakable sign that at the beginning of the twentieth century Great Britain had already taken her place in the main stream of the development in geographical science. In 1908 appeared the second of Mackinder's major writings under the title 'The Rhine, its valley and its history,' a subject which he had studied in literature and by personal observation from his earlier Oxford days. Between the publications of these books he had read a paper to the R.G.S. in 1904 on "The geographical pivot in history" [1]—a study of the relations between the "Heartland" of the "World-Island" and the marginal lands with sea-power; and in 1919 under the influence of political developments he elaborated its fundamental ideas in 'Democratic ideals and reality.'

Mackinder's political interests had an influence on his geographical thought, but they competed more than they cooperated with his academic work. It is a tribute to his abounding energy that in 1900 (while Director of the Oxford school, Principal at Reading, and Reader in London) he stood for Parliament. In this he was not successful, nor in a second attempt in 1909, but during all this time he had been politically active and in the following year he became Member for a Glasgow division. During the First World War his political work took on a national character and he rendered services for which he was knighted in 1920, and in 1926 he became Privy Councillor. Thus he was increasingly withdrawn from academic life—a change which became quite evident from about 1910. By this time Mackinder had resigned from Oxford and Reading, while in London, where several internal Colleges had now included Geography in their curricula and the external examinations affected teaching throughout the Kingdom, his experience and advocacy were less available though still sorely needed for the full recognition of the subject and the formulation of agreed syllabuses in the various Faculties. His colleagues, and indeed teachers everywhere and in all grades, felt the loss of his assistance and tended to regret that politics had claimed him.

This feeling was certainly shared by me at the time. But recently I have come to wonder whether perhaps he had already done the greater part of his work for Geography. The cause for which he had fought strenuously for more than a quarter of a century had now, in essentials, obtained victory, and the movement had acquired momentum which assured completion of all the

[1] *Geogr. J.* 23 (1904) 421–44.

original objectives. At the same time new developments had occurred. Teachers came to realize that earlier conceptions of Geography as a means of education must be revised, for example, by utilizing "heuristic" methods with practical work and individual experiment to supplement oral instruction, and also by taking account of the mental development of young people. In such ways the work of the Geographical Association moved beyond Mackinder's experience. Moreover in Geography as studied in the Universities there were developments in physical and biological science on the one hand, and on the other the emergence of fresh problems facing mankind. The task of relating these new data would probably have needed more intense study than could have been undertaken by a man engaged also in public affairs. Thus, by the time Mackinder entered Parliament, he had well and truly laid the foundations and others could proceed with the construction.

To sum up, I would suggest that Mackinder's special contribution to the rise of British Geography depended on four characteristics: his clear and unified view of its content and functions; his gift of effective exposition; his energy and organizing power in obtaining recognition for Geography; his ability to recruit younger men and to inspire them to continue his work. An important factor in his success was the time at which he appeared; for by the last quarter of the nineteenth century many minds had already accepted the fundamental conception of evolution and were now reaching out to a more definite understanding of the mode in which Nature and Man had evolved, and were still evolving, in mutual association. Other aspects of the time factor were that his work was greatly facilitated by the extraordinarily fortunate start provided by the R.G.S. with the cooperation of Keltie, Mill and others; by the concurrent though independent teaching of a few contemporaries including Chisholm; and by the later assistance of Herbertson and others. Another manifestation of the spirit of the age was that many teachers to whom he appealed, and upon whom the outcome of his mission ultimately depended, were now prepared to accept his basic ideas. Mackinder was the right man, in the right place, at the right time.

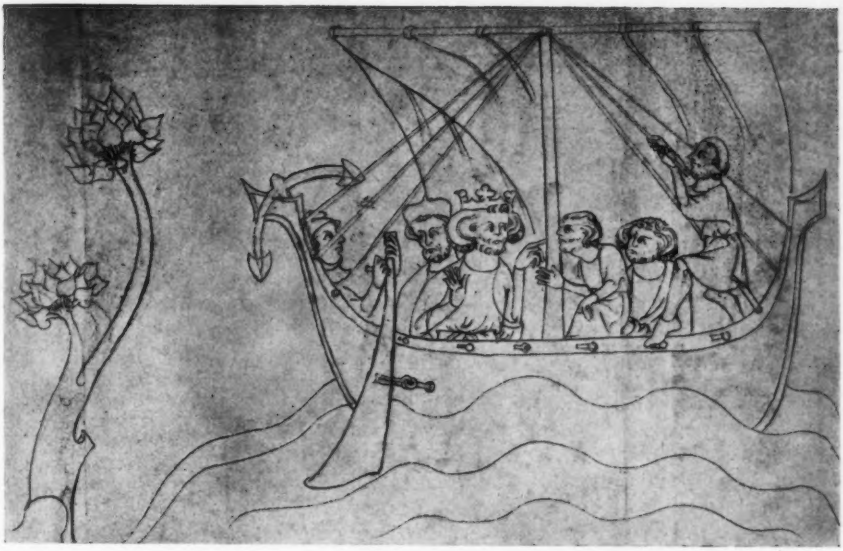
THE EARLY NAVIGATOR

E. G. R. TAYLOR

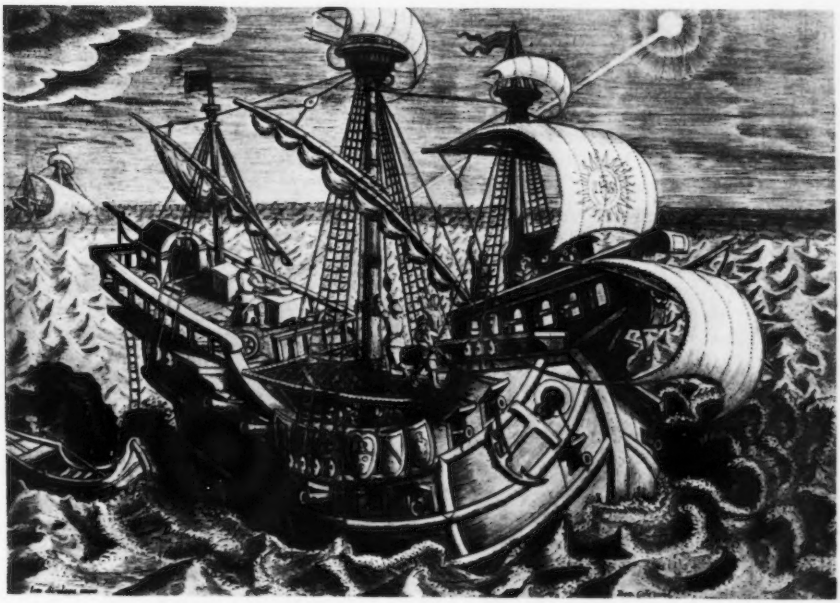
NAVIGATION, ACCORDING to the old definition, is to conduct a sufficient ship speedily and safely to her destination: and that is the essence of the navigator's task to-day. The idea of what constitutes a "sufficient ship" changes of course through the ages, and Plate 1 shows how royalty was carried overseas more than 700 years ago. You will notice that the helmsman and the sailor busy with the rigging are quite confident that they have a sufficient ship, but the passengers are obviously needing a little reassurance from the Master. In the oldest English technical dictionary, compiled in the reign of Queen Anne, navigation is further defined as being of two kinds, proper and improper. And by the latter the author meant the method of navigation employed in conducting such a vessel as you see here, with no other helps than the sounding lead and the familiar landmarks coupled with the Master's knowledge of wind and sky. Proper navigation was instrumental navigation, navigation by the chart, navigation across vast oceans. Yet we must not fall into the common error of supposing that the "improper" sailors of antiquity always hugged the shore. What John Harris the dictionary maker calls improper navigation sufficed to carry the Greeks regularly over the 350 miles between Rhodes and Alexandria, and the Vikings over the yet wider channel between Iceland and Greenland where they picked up the landmark Hvitsark —White-shirt—on the far side of Denmark Strait.

If we read such fragments of the sailing directions of antiquity as have been preserved, and set beside them the sailing directions of medieval times, and beside these again the modern Pilot Books, we can see that there has been an unbroken tradition of seamanship, so similar in wording are they all, telling of courses and distances, shoals and other dangers, land-marks, anchorages and watering places. The transition between improper and proper, if we may keep to this ridiculous verbiage, came slowly and very partially. But it seems that the mariner's compass and some form of chart were used almost before the steer-board which you see in the picture had given way to the rudder, and by about 1270 the King of Spain, Alphonso the Wise, could give orders (though they certainly could not have been widely obeyed) that all ships should carry compass and chart, besides an instrument for observing the height of the pole.

The oldest maritime chart that has survived is dated about 1300; it covers the Mediterranean and Black Seas. But its finished style and relative accuracy suggest a long history of chart-making behind it, while its most essential feature is preserved on the charts of to-day. This is the compass-rose from which the course or bearing to be sailed can be taken off by parallel ruler. The medieval chart-maker however put not just one but a large number of roses on the map and ruled differently coloured lines out from each point so that the whole chart was criss-crossed with lines, which made it easier to prick a course anywhere on the map.



1. A "sufficient ship" of seven centuries ago. (Cotton MSS. Nero. D.I.)



2. The Haven-finding Art, c. 1590. An observation with the azimuth compass. (Stradanus, 'Nova reperta')

3. Fifteenth-century tidal chart. The compass-rose indicates hours from north as noon. (From a MS., British Museum)

4. The Fly. A tide table for English and Channel ports, 1569. (From a contemporary Almanack)

Outside the busy Mediterranean Sea one of the most important trade routes was that bringing wine to the Channel ports and to the Low Countries, and since direct delivery was made to dozens of small ports the shipmaster had to know the state of the tide. That meant that he must know the establishment of the port (the lunitidal interval or number of hours the tide was late on the meridian passage of the moon) as well as the age of the moon, while he must also know the time by day and by night. Plate 3 shows a fifteenth-century chart giving the establishment of various ports. A set of such charts would be bound up with a calendar giving the Saints' Days and the phases of the moon. The compass-rose with its 32 points was used by sailors where astronomers would use a graduated circle of 360°. It served also as a clock-face on which each point measured 45 minutes, and could be reckoned therefore as the daily retardation of the tide. If the establishment of the port was 3 hours, it would be described from the rose as "moon at north-east–south-west." The 32 points again served to tick off the 30 days or thereabouts of the lunar month. Plate 4 shows a different form of tide-table with a set of rebuses for the names of the ports, since many seamen would be illiterate. As for the sky, the sailors' constellation right back to the prehistoric days of the early Phoenician sailors was always the Lesser Bear with the Pole Star or Stella Maris in its tail. It gave them direction; when proper navigation began it gave them latitude; and it also gave them a clock. The two stars next in brightness to Stella Polaris were called the Guards or the Two Brothers, and the front Guard, now called on star maps by its Arabic name *Kochab*, served as the hour hand of the sky clock. The landsman used the Great Bear in the same way. A star clock gets 4 minutes slow every day on sun time, so it has to be advanced an hour every fifteen days; the hand, of course, moves "backwards."

Long before Columbus went to sea, the discovery by the Portuguese of the Azores and other Atlantic islands which they immediately colonized made proper navigation by celestial observations a necessity. The navigator had to determine latitude, and unfortunately for him the Pole Star was then about $3\frac{1}{2}°$ from the celestial pole, so that after taking its altitude he had to make a correction. Prince Henry the Navigator employed Jewish mathematicians to draw up the necessary tables and rules, and a little later they provided tables of solar declinations for working out the latitude near and beyond the Equator where the Pole Star could not be used. The Navigating Manuals made for the Portuguese sailors are the oldest manuals of modern instrumental navigation ever written, although they were quickly copied and improved by the Spaniards after Columbus' voyage. In Queen Elizabeth's day our sailors used English translations of Spanish manuals, although they liked to get hold of Portuguese sailing directions when going to Africa or to Brazil or round the world. Instrumental navigation meant of course that pilots must master some mathematics, including the degrees of the circle instead of merely the compass points. Of the three instruments that pilots and navigators commonly used, the astrolabe, the quadrant and the cross-staff, many preferred the last as it was graduated so as to give the answer without any necessity of reading a scale of degrees.

In so brief a space I can only touch on some of the more striking landmarks

in the history of navigation; but I must include three problems, namely, projection of the chart, variation of the compass and determination of longitude.

As to the chart, mathematicians were not slow to point out to sailors that whereas on their charts all north–south lines were drawn parallel, in actual fact they converged upon the pole. But it was idle for them to demonstrate that rhumb lines followed spiral courses on the globe, for sailors did not use globes and they could always retort that their plain charts, as they were called, served their purpose since they did in fact arrive at their destination. If they were a few score or even a few hundred leagues out of their reckoning, ocean currents or even malignant stars gave reason enough. Mercator invented his chart on which rhumbs were projected as straight lines in 1568, but to use it it was necessary to employ a different scale at each latitude when working out the easting or westing (departures) made good, and not until the seventeenth century were the requisite rules worked out. The Manuals then contained three methods of reckoning; for Plain Sailing, Mercator Sailing and Great Circle Sailing. Can it be wondered at that seamen preferred plain sailing?

As to the compass variation, it was concealed from them by the compass makers who fastened the fly on to the needle so that it read true north. This was well enough if the ship was not leaving European waters. But we all know of Christopher Columbus' confusion when he passed from the region where the variation was east to that where it was west. And Cabot's discoveries opened the Newfoundland fishing banks where the variation was well over two points ($22\frac{1}{2}°$) W. Hence the better-instructed pilots began to demand what became known as an azimuth compass by which they could check the variation each noon.

As knowledge of the variation increased, more and more theories were formed as to how it could help to solve the longitude problem. For it seemed likely that the lines of equal magnetic variation ran smoothly like a second set of meridians across the globe, meeting either on the globe itself or at some point in space, and hence the ship's position east or west on any parallel of latitude could be recognized. Plate 2 shows a ship's officer working out her position by this means. Unfortunately the theory was fallacious, but even after the secular variation of the variation was discovered it was not abandoned. An aged teacher of navigation living on Tower Hill worked out elaborate tables based on this theory which he published as 'The longitude found' in 1674, to which a critic replied with 'The longitude not found' in 1676.

Of course, ever since watches had been invented it had been realized that to carry a perfect time-keeper to sea would solve the longitude problem, and hopes ran high when in 1657 Huygens invented the pendulum clock which really did keep good time. Charles II had one tried at sea in the Royal Yacht and on a voyage to West Africa, but unfortunately the pendulum and the ship's motion did not agree well together. Amateurs from time to time made the usual fantastic suggestions, like making an hour glass that took 24 hours to run out and turning it every day, or timing the tides in mid-ocean. In theory, too, the position of the moon in relation to the stars, or the occultation of Jupiter's satellites would give the answer. But these same amateurs could

not understand that not until something like a Nautical Almanack was available was such a method practicable—and the Almanack was lacking. So it remained to depend upon dead reckoning and the log-line—or the chip which the Dutch seamen threw overboard to measure the ship's way, which in a glorified form seamen still use as the Dutch log. Fortunately for safety at sea, the nautical instrument-makers in the reign of Charles I did something to improve dead reckoning by quietly re-knotting the log-line on the advice of certain mathematicians in accordance with a more accurate value of the length of a degree. Sixty miles still went to a degree, but they were, unknown to the simple sailor, longer miles. So the nautical mile and the statute mile parted company.

Perhaps more fundamental than any of these individual problems was that of the training of the ship's officer. Mr. Pepys, Secretary of the Navy, did not himself know the multiplication table, but he was quite certain that mathematics was necessary for the sailor. But mathematics in those days formed no part of the education of a gentleman. When it was decided that William Dampier should go to sea, he had to leave the grammar school and go to a writing master who at least taught arithmetic. But this question of education is a story in itself. Let Dampier speak for navigation as it was just when Queen Anne came to the throne. At the very outset of his voyage of 1699, standing down the Channel in the night, H.M.S. *Roebuck* was found to be unpleasantly near the French coast next morning: a "Mistake, which I have heard" says Dampier "is a very common one and fatal to many ships. The Occasion of it is the not allowing for the change of the Variation since the making of the Charts." He was therefore very diligent in observing the variation throughout his passage to New Holland, finding however that his officers were unskilled in the matter and that the operation itself was difficult, not only because the needle swung with the ship's motion but because "there is often some difference between him that looks at the Compass and the Man that takes the Meridian Altitude height of the Sun." He himself was shocked to find that the variation was not proportional to longitude and only grasped the true position regarding it when on his return he was shown the first isogonic chart, that made by Edmond Halley, author too of the first general chart of the winds. But Dampier's worst errors were due to his sticking to the plain chart, which made, for example, his position by dead reckoning over 150 miles out in the voyage from Brazil to Cape Town, for the convergence of the meridians was ignored. "Whether the fault were in the Charts . . . or were rather in our Reckoning I could not tell: but our Reckonings are liable to such uncertainties, from steerage, log, currents, half-minute glasses . . . and sometimes want of care. . . ." Want of mathematics, want of reliable instruments and of official charts: these were even greater wants. Fortunately the eighteenth century saw the beginning of a new era in navigation, by methods now far beyond amateur understanding.

A NEW DEVELOPMENT SCHEME FOR THE OKOVANGO DELTA, NORTHERN KALAHARI

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THE KARIBA PROJECT [1] foreshadows important geographical changes in Southern Africa, both economic and physical. Superficially, the most spectacular physical change will be the formation of a great artificial lake possibly 200 miles long, impounding the annual flow of the Zambezi, here amounting to some 40 million acre-feet. To generate the proposed half million kilowatts, the whole flow of the Zambezi will be required; no other major diversion scheme will be possible higher up the river. If therefore the Kariba project is approved, Katombora must be finally abandoned and the "Kalahari scheme" [2] envisaged by Schwarz and examined by A. L. du Toit's reconnaissance party in 1925 falls with it.

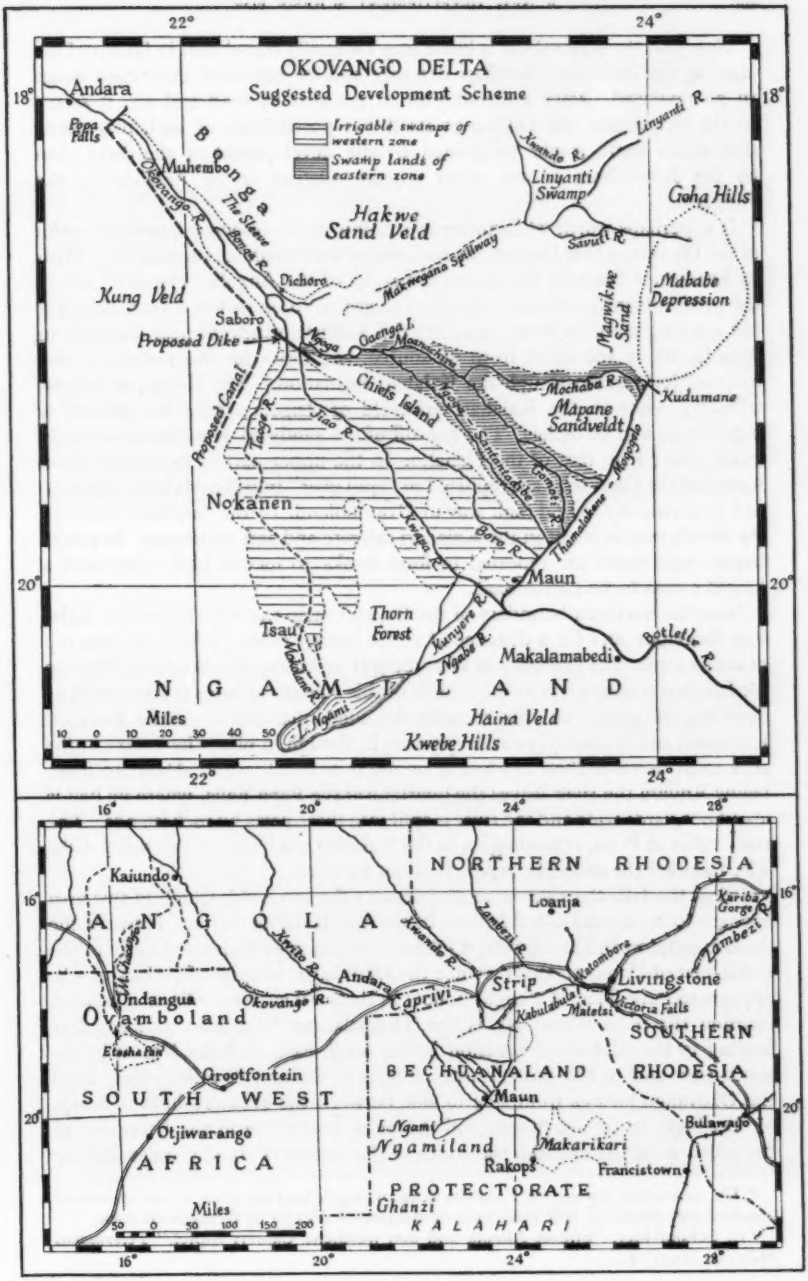
It is perhaps well to recall the situation in the Northern Kalahari as revealed by the 1925 reconnaissance survey.[3] Schwarz's suggested dam at Kabulabula was found to be impracticable both on account of the unsuitability of the site and the insufficiency of the Linyanti waters. But it was found possible to site a dam at Katombora which would impound most of the flow of the Zambezi, diverting the water along the Thamalakane channel into the Botletle. Such a diversion would create two lakes having a combined area of 4600 square miles covering the Linyanti swamps and the Mababe depression, and providing sufficient water to irrigate about half a million acres along the lower Botletle. To accomplish this, 20,000 *cusecs* of the Zambezi mean flow of 38,000 *cusecs* would have to be impounded.

The Katombora scheme has never been implemented; chiefly, it seems, because of the threat to the Victoria Falls but also because the reaction of the Kalahari soils to irrigation is not well known. In the lower Botletle basin, calcrete underlies the surface soil of a considerable area and the risks involved in irrigating such soils are great. Leaving out of account the more disputable consequences of the Schwarz scheme, the calculable effects of the Katombora scheme appeared to many to be scarcely worth the £6 million investment. As a preliminary to the whole scheme, Du Toit suggested irrigating a part of the Mababe depression by re-opening the Savuti channel. But here again the subsurface limestone is present at any rate in some parts of the depression, and the irrigation of 125,000 acres here might have as its main value the testing of these soils under irrigation water.

[1] The project, now being investigated by the Central African Council, is the damming of the Zambezi in the Kariba gorge a few miles below the Sanyati river confluence to generate electrical power for the industries of the Rhodesias and to irrigate the extensive flats below the dam as far as Chicoa.

[2] E. H. L. Schwarz, 'The Kalahari or Thirstland redemption,' Cape Town, 1920.

[3] 'Report of the Kalahari reconnaissance of 1925' (Pubn. of the Union of S.A. Dept. of Irrigation), Pretoria, 1926.


OKOVANGO DELTA
Suggested Development Scheme
Irrigable swamps of western zone
Swamp lands of eastern zone
Andara
Popa Falls
Muhembon
Okavango R.
The Sleeve
Bonga R.
Dichore
Makwegana Spillway
Hakwe Sand Veld
Kung Veld
Saboro
Proposed Dike
Proposed Canal
Kwega
Gaanga I.
Moanachira
Chiefs Island
Tauge R.
Jiao R.
Nokanen
Xwaga R.
Bora R.
Thamalakane - Nxoxoto
Mochaba R.
Mapane Sandveldt
Kudumane
Magwikwe Sand
Mababe Depression
Kwando R.
Linyanti R.
Linyanti Swamp
Goha Hills
Savuti R.
Tsau
Makalaka R.
Thorn Forest
Kunyere R.
Ngabe R.
Maun
Makalamabedi
Botletle R.
NGAMILAND
L. Ngami
Haina Veld
Kwebe Hills
Miles
10 0 10 20 30 40 50
22°
24°
18°
20°
NORTHERN RHODESIA
ANGOLA
Kajundo
Loanja
Kariba Gorge
Zambezi R.
Kwando R.
Zambezi R.
Katombora
Livingstone
Caprivi Strip
Kabulabula
Mateisi
Victoria Falls
Mt. Chiongo
Xinlle R.
Andara
Okovango R.
Ondangua
Ovamboland
Etosha Pan
Grootfontein
SOUTH WEST AFRICA
BECHUANALAND PROTECTORATE
Maun
L. Ngami
Ngamiland
Makarikari
Rakops
Ghanzi
KALAHARI
SOUTHERN RHODESIA
Bulawayo
Francistown
Otjiwarango
Miles
50 0 50 100 150 200
16°
20°
24°
28°

Now that the Katombora scheme may be finally abandoned in favour of the Kariba, the Northern Kalahari drainage and its economic utilization needs to be reviewed. After a recent visit to the area by road and air, it seems to the writer that the Okovango itself has possibilities of such magnitude that much more might be gained by the development of the delta than by the Katombora or any other scheme relating to the Zambezi or the Linyanti.

It is perhaps worth while to mention a few of the important characteristics of the Okovango that bear on the question of its economic potentialities. With its headwater basin in the crystalline rocks of the Angola "Planalto" where the predominantly summer rainfall averages 50 to 60 inches a year, the river has a strong summer flow. It enters the Kalahari sandveld near Caiundo in Angola, about 200 miles from its source, and flows for the remaining 800 miles of its course through the Kalahari formation.[1] The Kwito, its largest tributary, rises in the Kalahari sandveld of Angola where the rainfall is between 40 and 50 inches. The run-off of the sandveld however is certainly much lower than that of the Planalto. In the upper part of its course, flood waters of the Okovango are reported to "spill over" into the Mulola Chacango and so eventually to find their way to Ovamboland. In the sandveld however the river's course is cut in the Kalahari calcrete and soft sandstone. In places harder sandstones are reported to form banks 30 metres high [2] but such a height seems to be exceptional.

Near the northern boundary of the Caprivi Strip the river leaves the Kalahari formation and for a distance of about twenty miles traverses an outcrop of ancient quartzite probably of Waterberg (Cambrian) age. Andara's Mission (or Libebe) is situated near the middle of this stretch. The river has evidently been superimposed on this recently denuded quartzite from the Kalahari formation and has not yet cut deeply into it, though in places its course in the rock must be more than 100 feet deep and over a mile wide. About 10 miles below Andara the river leaves the quartzite at the Popa Falls, where its bed is about 900 yards wide and the river is split into three parts by rock islands. The river valley at Popa, extending on to the Kalahari sand, is over two miles wide. The fall over the stair-like rapids is about 15 feet.

Below the falls the river once more enters the sandveld, which in this area appears to be a sand-filled hollow in the pre-Kalahari surface between the Andara outcrop and the Kwebe–Goha line of outcrops about 200 miles to the south-east of Popa. In this distance the Okovango, in spite of its lack of silt, appears to have filled in a slight hollow in the sand surface with its alluvium, forming the delta whose arc is the Thamalakane–Mogogelo drainage line leading to the Mababe depression in the north-east, to Lake Ngami in the south-west and to the Botletle eastwards. For the first 80 miles below Popa the Okovango swings from side to side between the Hukweveld sand scarp, 60 feet high, to the north-east and the more gentle rise to the Kungveld to the south-west. At Dichoro the width of the swamp is about 7 miles and the

[1] The formation comprises Kalahari sand of depth varying from a few to several hundred feet overlying soft sandstone or calcrete or silcrete or ferruginous rock.

[2] E. Schonfelder, "Südost-Angola und den westliche Caprivi Zipfel," *Petermanns Mitt.*, 81 (1935) 49.

1. The Okovango at Muhembo

2. Kudumane district of the Okovango swamps

3, 4. In the swamps. The lower picture shows dense papyrus growth

river has already begun its anastomosis, dividing into the Taoge, Ngogo and Bonga channels.

The details of the channels and the swamps of the delta have been described by Stigand and by Rey.[1] The outstanding fact in the development of the delta since about 1888 appears to be the gradual and continuous choking of the western channels, the Taoge and the Jiao, and the concentration of water in the Ngogo channel on the eastern side of Chiefs Island. Of the other major channels, only the Boro and the Gomoti normally contribute water to the Thamalakane. The waters of the Mogogelo and Mochaba rarely reach the arc of the delta. During the exceptionally high flood of 1925 however the Mogogelo and the Kudumane passed the Magwikwe sand ridge bordering the Mababe depression but did not reach the depression itself.

The main distributary, if it can be so described for its greater depth and freedom from obstructions, is now the Ngogo–Santantadibe channel which carries most water to the Thamalakane. In 1939 a boat traverse by Captain S. E. Davies from near Muhembo to Maun showed the main channel to vary in width from 150 yards at Muhembo (Plate 1) to 30 feet in places near Gaenga Island; the depth varied irregularly from about 11 feet at Muhembo to maxima of about 17 feet near Gaenga. About 6 miles to the south of the Moanachira outflow the Ngogo channel was blocked for $2\frac{1}{2}$ miles so completely with old *makawas* (papyrus rafts) and dead papyrus that it took the work-party of fourteen natives eight days to clear a passage. After this the channel became more open, with widths varying from 15 to 40 yards and depths from 8 to 12 feet. The Santantadibe channel however was very ill defined, its width varying from 3 to 100 yards. In the last 7 or 8 miles above its *embouchure* at the Thamalakane its average depth was only about 2 feet. From precise levels taken in 1939 from Gaenga Island (3176 feet above sea-level) to the Santantadibe mouth (3071 feet), J. L. S. Jeffares found the hydraulic gradient to be approximately 1:5000.[2]

We are thus dealing here with a swamp area in which water depths of 17 feet are exceptional and where the average gradient of a little more than a foot to the mile is maintained from the head of the delta to the arc. Not all of the delta is annually submerged; the inundated areas shown by Stigand [3] in 1932 would have now to be somewhat modified in the western part of the delta, for the Taoge has changed probably more than any of the other channels in recent years. Water in the Taoge now rarely flows past Matetemetso, about 10 miles north of Nokanen, and the channels by which it formerly reached Lake Ngami are continually dry (Plate 6).

Regimen of the Okovango

The general regimen of the Okovango with its summer flood and winter low flow is well known. At Muhembo, where the river enters Bechuanaland, the minimum flow occurs usually late in September or early in October, but during the past 15 years it has been recorded as late as November 30. The

[1] A. G. Stigand, "Ngamiland," *Geogr. J.* 62 (1923) 401–19; and C. F. Rey, "Ngamiland and the Kalahari," *ibid.*, 80 (1932) 281–308.

[2] L. A. Mackenzie, 'Report on the Kalahari expedition, 1945,' p. 11, Pretoria, 1946.

[3] Stigand, *op. cit.*, map ff. p. 476.

maximum flow occurs generally in February or March, but during the period of record it has been as early as January 24 and as late as May 8. Table I [1] shows the dates of maximum and minimum flows at Muhembo. The water-levels refer to zero on the gauge, but the height of this zero mark above mean bed level is not known. From various soundings however it seems to the writer to be about 5 feet.

Table I—Regimen of Okovango river at Muhembo

	*Maximum water-level (in feet)**		*Minimum water-level (in feet)**	
1933 ..	Feb. 28	9·60	Sept. 30	2·50
1934 ..	Mar. 30	10·80	Sept. 30	3·00
1935 ..	Jan. 31	9·50	Sept. 30	2·20
1936 ..	Mar. 29	9·70	?	?
1937 ..	?	?	Sept. 30	2·50
1938 ..	Feb. 27	7·40	Sept. 30	1·00
1939 ..	Feb. 28	8·60	Oct. 15	1·00
1940 ..	Apr. 6	11·20	Oct. 30	1·30
1941 ..	Mar. 30	8·00	Nov. 30	0·70
1942 ..	Apr. 14	6·65	Oct. 22	0·75
1943 ..	May 8	9·55	Oct. 30	1·10
1944 ..	Apr. 9	12·80	Oct. 30	1·95
1945 ..	Apr. 3	9·80	Oct. 30	1·00
1946 ..	Jan. 24	8·10	Sept. 20	1·00
1947 ..	Mar. 15	10·90	—	—

* Height above gauge zero; probably about 5 feet above mean bed level.

The Okovango flood waters reach the arc of the delta about four months after passing Muhembo, and the maximum level of the Thamalakane at Maun occurs generally in July or August. During the period of record however the maximum has occurred also in December, January, February and March (Table II). These summer maxima however are undoubtedly due to local rainfall which in some seasons is heavy. In 1946 for example the January and February rainfall at Maun exceeded 18 inches, producing an immediate rise in the Thamalakane. The minimum river level at Maun during the period of gauging has occurred in all months except February, July and October.

In the absence of precise measurements of the depth and velocity of the river, the discharge of the Okovango at Muhembo may be estimated roughly by taking the width of the river to be 450 feet, the average depth of the river bed below the gauge zero to be 5 feet, and the high-flood and low-water velocities to be 5 feet and 2 feet per second respectively. From these approximations the average high flow for the period 1933 to 1947 is 33,000 *cusecs*, the average low flow 6000 *cusecs*, and the average for the year 14,000 *cusecs*[2] which is

[1] Tables I and II are from information kindly supplied by the Government Secretary, Mafeking.

[2] From monthly gauge levels for 1944–45 and 1945–46 it appears that the average monthly gauge level is about 38 per cent. of ½ (maximum + minimum) for the year.

equivalent to an average annual discharge of about 10 million acre-feet. These estimates are not discordant with the gauging of L. A. Mackenzie,[1] who found a flow of 7500 *cusecs* in the single channel 3 miles above Andara

Table II—Regimen of the Thamalakane river (Okovango system) at Maun

	*Maximum water-level (in feet)**		*Minimum water-level (in feet)**	
1933 ..	June 30	5·72	Apr. 30	1·00
1934 ..	July 31	8·00	Jan. 1	5·28
1935 ..	Jan. 1	6·60	Sept. 30	4·98
1936 ..	June 30	9·00	?	?
1937 ..	June 30	10·45	Nov. 30	7·12
1938 ..	Dec. 31	7·45	Apr. 30	5·70
1939 ..	Mar. 31	9·25	Jan. 1	7·45
1940 ..	Aug. 25	12·00	Mar. 1	7·25
1941 ..	Feb. 15	10·35	May 30	7·25
1942 ..	July 31	8·05	Nov. 30	0·00
1943 ..	Aug. 31	2·50	June 30	0·00
1944 ..	Aug. 12	9·00	Jan. 1	1·90
1945 ..	July 20	5·70	June 8	0·88
1946 ..	Feb. 28	4·81	Dec. 31	1·30
1947 ..	Gauge washed away Jan. 26 to June 2			

* Height above gauge zero. Height above mean bed level not known.

on 22 July 1945, and they agree substantially with the observations of J. L. S. Jeffares who records discharges of 13,200 and 6700 *cusecs* at Begane (between Popa Falls and Muhembo) in July and October 1937.[2]

Irrigable areas

For convenience of calculation the delta may be divided into three fairly distinct parts: the "Sleeve" from Popa Falls to Dichoro, the Taoge–Boro swamp area to the west of Chiefs Island which we may call the Western zone, and the Ngogo–Mochaba swamps to the east of Chiefs Island, the Eastern zone.

Using Stigand's map as a basis for calculation, the areas flooded continuously or annually are roughly: the Sleeve 340 square miles; the western zone 2000 square miles, and the eastern zone (including the Bonga swamp below Dichoro) 1200 square miles: a total of about 3500 square miles. Stigand's "formerly flooded areas" include some 1000 square miles in the western zone, 275 in the Ngami lake floor, and a little over 400 square miles in the Mababe depression. Together the present and former flood-areas amount to rather more than 5000 square miles, over 3 million acres. It is of course no coincidence that the average annual discharge of the Okovango is just sufficient to flood this surface to a depth of over 3 feet. Three feet of water annually with a gradient of one foot to the mile suggests almost perfect hydrographic conditions for irrigation.

[1] *Op. cit.*, p. 5.
[2] Personal communication.

The importance of the delta itself as an area for irrigation derives from the fact that the soils do not apparently contain concentrations of injurious salts, nor are they underlain by the zone of lime accretion which characterizes so much of the sandveld sub-soil. Whilst the soils of the delta have not yet been thoroughly examined, the 1945 expedition inspected them in various places. They found them to consist of a 6-inch surface layer of black soil underlain by white sand passing into yellowish clay at a depth of 3 to 4 feet.[1] The report states that although there is a surprising lack of humus, the soils could no doubt under proper treatment be made to yield good returns of cereals, groundnuts and perhaps rice and cotton. In the extra-swamp areas the case may be different, for there are signs that in both the Ngami [2] and Mababe [3] areas saline sub-soils may prove to be troublesome.

The Okovango Scheme

The suggestion here put forward is the utilization of the average low-flow volume of the river for the irrigation of part or all of the western zone of the delta. It appears to be possible to isolate and drain this zone by constructing a mud embankment or dike from the northern end of Chiefs Island to the western sandveld margin near Saboro. Since even the deepest channels have a maximum depth of only about 17 feet, such an embankment would probably need to be only some 20 feet high. The swamp of the eastern zone of the delta could remain for the present and the Ngogo–Santantadibe channel could be enlarged to drain off excessive flood waters to the Thamalakane and Botletle.

At Popa a low dam or weir would be sufficient to divert water to a canal along the western sandveld margin of the Sleeve. A fall of between about 20 and 30 feet from the sandveld margin to the swamp level ensures an effective command of the marshland. The apparent fall of a foot in the mile towards the Botletle provides a natural drainage towards the Makarikari depression. Two million acres could thus be irrigated with little more than the average low flow of the river.

It might be objected that the reaction of the delta soils to irrigation is not known and that commitment to such a scheme ought to depend on the results of a fair test. With this the writer agrees. He suggests that as a first step the Chiefs Island–Saboro dike be constructed and the Ngogo–Santantadibe channel deepened and where necessary widened. Small areas in the western zone could then be irrigated from a sluice in the dike, or by pumping.

One by-product of such a scheme appears to be of some importance. At present the tsetse fly belt [4] is extending farther and farther south-westwards towards Lake Ngami, now one of the few remaining pasture areas of the Batawana (Plate 5). There appears to be nothing to stop the advance of the fly in this direction. The draining of the western swamp however and the removal of the bush from the non-flooded areas in this zone would probably

[1] L. A. Mackenzie, *op. cit.*, p. 15.

[2] J. B. Pole Evans, 'An expedition to Ngamiland, June–July 1937' (Botanical Survey of S.A., Memoir No. 21), p. 83, Pretoria, 1948.

[3] 'Report of the Kalahari reconnaissance of 1925,' p. 144, Pretoria, 1925.

[4] Shown on the official Bechuanaland Protectorate map (1933) and on Stigand's map (*loc. cit.*).

5. Thorn encroachment in Lake Ngami basin, proposed for irrigation

6. Mokolane, dry lower course of Taoge in western delta

have the effect of limiting the fly to the eastern swamp zone and greatly increasing the present tsetse-free pastures.

The adoption of such a project for the delta would of course necessitate reconsideration of the proposed trans-Kalahari railway.[1] The general direction of this proposed route to Rakops was doubtless suggested by the implications of the Katombora scheme. If the development of the delta were decided on, the economic centre of the Northern Kalahari would be Maun or some part of the delta and the railway should link Matetsi with Maun and the Ghanzi area rather than with Rakops and the Haina veld.

In concluding, it is perhaps worth while comparing the conditions in the Northern Kalahari with those bordering the Sahara. The former are not of course quite parallel with the Niger swamps below the Sansanding dam[2] where the French have reclaimed nearly two million acres of former swampland,[3] but there seems to be no reason to doubt that rice, groundnuts and cotton could be produced by native cultivators in the drained Okovango marshes as they are in the Macina and the Sahel.

Recognition of the great potentialities of the Okovango delta is not altogether new; it finds a place not only in the most recent of the authoritative reports on this part of Africa[4] but in those of administrators of forty years ago. It was in the 1908 report of the Bechuanaland Protectorate that the Government Secretary expressed the opinion: "It is not too much to suppose that in the days to come the flow of the Okovango will be controlled, and that by a system of canals that region, to-day a desolate swamp, and many hundreds of square miles bordering upon it, may become land capable of the highest cultivation. Some day Ngamiland may be known as the Egypt of the south."[5] In these days of large-scale African development, is it not opportune to bring this vision to fulfilment? The soil promises well, water is abundant, capital and labour alone are needed to transform this useless swamp into one of the richest gardens of Africa.

[1] J. L. S. Jeffares, 'Report on the Rhodesia–Walvis Bay reconnaissance survey,' Salisbury, 1932.

[2] Jean Gabus, "La colonisation de la boucle du Niger," *Bull. Soc. Neuchâteloise Géogr.* 51, No. 2 (N.S. No. 3) (1945) 1–51.

[3] See note on "Colonization in the Niger elbow," *Geogr. Rev.* 37 (1947) 150–1.

[4] Frank Debenham, 'Report on the water resources of the Bechuanaland Protectorate, etc.' (Colonial Research Pubns., No. 2) London, 1948.

[5] 'Bechuanaland Protectorate. Report for 1907–8' (Colonial Reports No. 593), p. 10, London, 1908.

THE FORMATION AND MOVEMENT OF SAND BARS BY WAVE ACTION

C. A. M. KING AND W. W. WILLIAMS[1]

Types of sand bars

SAND BARS LYING PARALLEL to the coast are characteristic features of many sandy beaches and are found under widely different circumstances. They vary considerably in size and form, but all belong to one of two types; one type being found on non-tidal beaches and the other on beaches with a considerable tidal range. This latter type will be referred to as "ridge and runnel" beaches to avoid confusion with the former type, which will be called "barred beaches."

Barred beaches, typical of tideless seas, are very common in the Mediterranean and Baltic Seas. The submarine bars may be of two distinct patterns; the first consisting of several parallel bars, rarely more than four, which are comparatively straight and parallel to the waterline (Plate 1). The second consists of a number of crescents of sand, the points facing inshore (Plate 2). The rows of crescentic arcs usually have regular chord lengths. It is noticeable that the lengths of the arcs in deep water are longer than those of the shallow-water systems. In all cases the bars, which are formed below sea-level, are never exposed above the water surface, which is comparatively constant in level.

The ridge and runnel type is found only on a limited number of tidal beaches. A good example is the beach at Blackpool. This beach was studied closely during the war because of its similarity to some of the Normandy beaches, where British landings took place in 1944 (Plate 3). The sand ridges on these beaches are exposed at low tide, and are intersected by drainage channels at right angles to the waterline.

Observations on form and movement of bars in tideless seas

Straight bars, North Africa.—Bars of this type were first studied in detail during 1943–44 when landings were taking place on beaches in the Mediterranean. They were found on nearly all sandy beaches with a gradient flatter than 1 in 70.[2] The straight bar form was characteristic of open beaches, while the crescentic bar was usually, but not invariably, confined to embayed beaches between headlands. The literature concerning the formation and movement of these features was meagre. It was however soon observed that they were subject to rapid changes in height and position. For example, the bar off the beach in the Bay of Salerno was cleared by landing craft on the

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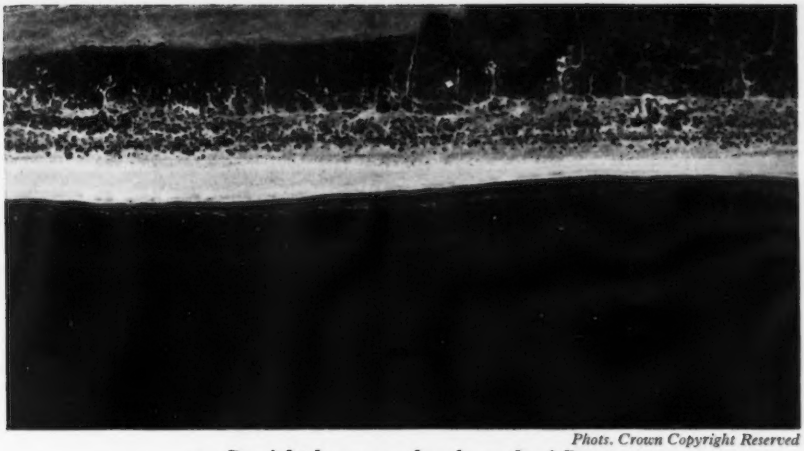
[2] Unless otherwise stated, beach gradient figures refer to the zone between the waterline and the two-fathom line.



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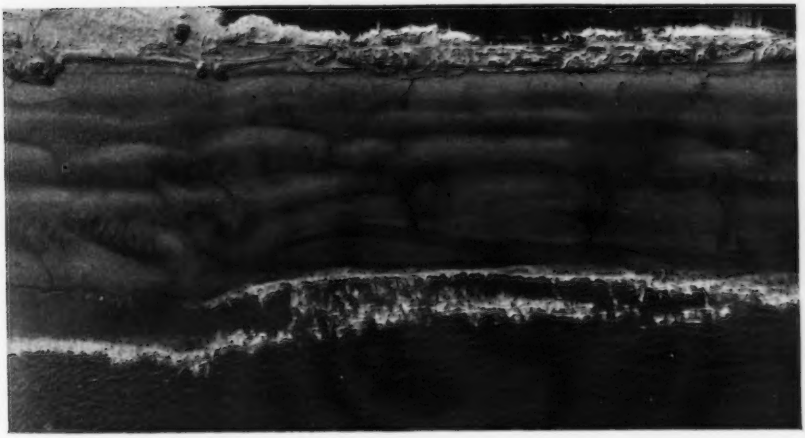
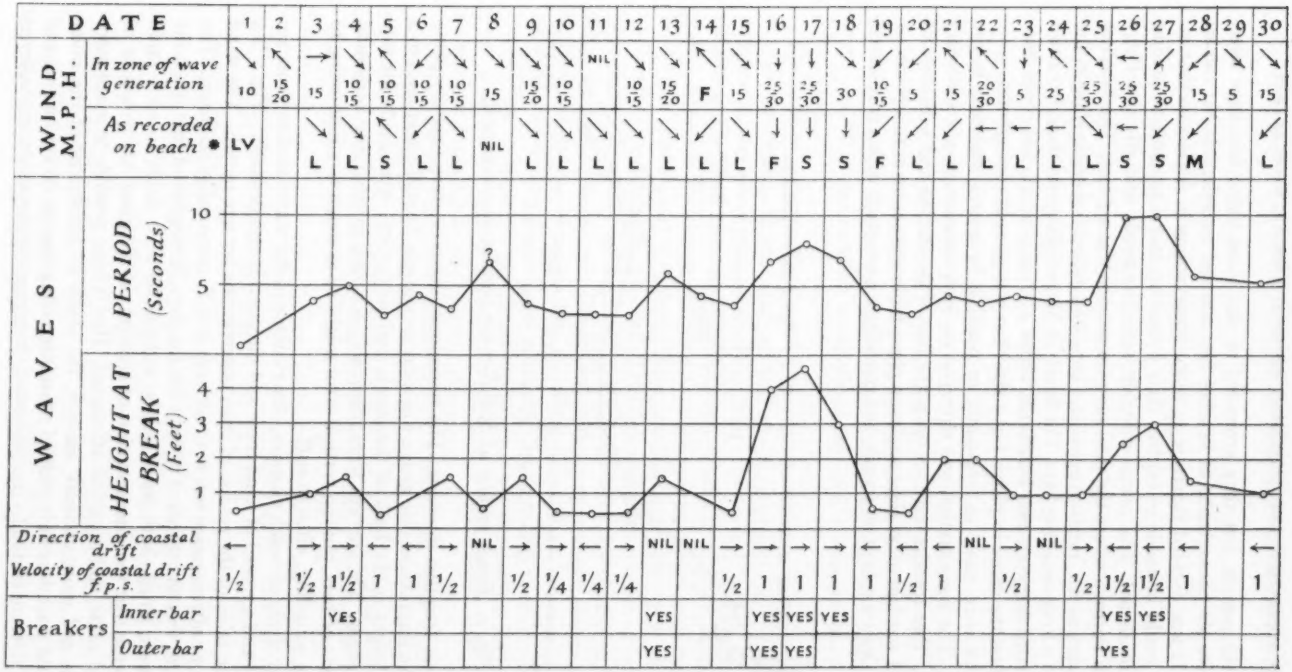
1. Straight bars on a beach south of Rome

2. Crescentic bars at Castellabate, Gulf of Salerno



3. Ridge and runnel beach used for Normandy landings. Mean low spring tide level is near outer line of breakers


DATE
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
WIND M.P.H.
In zone of wave generation
As recorded on beach * LV L L S L L NIL L L L L L L L F S S F L L L L L S S M L
WAVES
PERIOD (Seconds)
10
5
HEIGHT AT BREAK (Feet)
4
3
2
1
Direction of coastal drift
Velocity of coastal drift f.p.s.
Breakers
Inner bar
Outer bar
YES

Arrows indicate direction of wind or coastal drift relative to the waterline
* L=light V=variable F=fresh S=strong M=moderate

Fig. 1. Record of wave height and period, coastal drift and wind at Moretti Plage, April 1944

day of the assault, but they grounded on the same bar a few days later. Successive air photographs of beaches also showed considerable bar movements. It was decided therefore to make observations in Algiers so that an attempt could be made to explain their formation and if possible to predict their movements. The places selected were Douaouda and Moretti Plage near Sidi Ferruch where the tidal range at springs was 2·5 feet. The beach at Douaouda was flat, uninterrupted and consisted entirely of sand, lying in the centre of a long sweeping bay. The beach at Moretti Plage on the other hand was situated between two headlands about 2^1_2 miles apart, flat rocks outcropped on the shore in places but a sand bar was present throughout.

Surveys were made as frequently as possible by a unit stationed in the vicinity. The same section was surveyed on each occasion by the following method. Two transits were set up in the line of the section and a distance of 1000 feet was laid off at right angles; a plane table was set up at this point. A 12-foot Dory was kept on transit, and soundings were made with a wire-cored

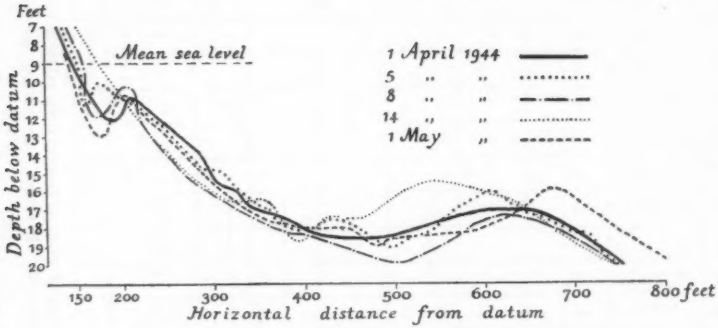


Fig. 2. Beach profiles at Sidi Ferruch showing bar movements

leadline at frequent intervals. The horizontal distances were fixed by plane table. An improvised tide gauge was used to connect the still-water level to a known height at the back of the beach, and corrections were made for tide level changes. The surveys were reasonably accurate in recording horizontal movement of bars, but the vertical error might be as much as 1 foot owing to errors in sounding, often in surf.

In any study of beach changes, observations of the waves and currents are essential and a record of wind force and direction is also desirable. Fig. 1 is a specimen table of the results of such observations for one month. The wind in the zone of generation was derived from R.A.F. meteorological charts. The local wind was an estimated average for the day. It was found that when the waves were small, both wave height and period were liable to such rapid movements that the interpretation of changes on the inner bar would be of doubtful value, and none was attempted. Had it been possible to make more frequent and more accurate surveys, the study of movement of the inner bar would doubtless have yielded most interesting results. Wave heights and periods were measured by inexperienced observers, but the results are believed

to be reasonably reliable. Wave heights were estimated at the outermost breaker. The greatest height recorded was 5 feet, but it is almost certain that higher waves did in fact occur, for instance during the storm of 26–27 April 1944 when waves were breaking in 8 feet of water. The observations for drift are not precise, but they are a fair indication of the conditions on the inner bar. The current when observed on the outer bar was found to be in the same direction as on the inner bar but less rapid. The close correlation between wind direction and current direction is clearly shown. It was clear that more precise and detailed observations were needed if quantitative conclusions on bar movement were to be formulated.

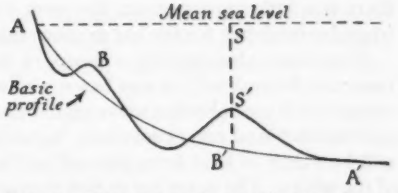


Fig. 3. Diagrammatic profile of a barred beach

The profiles shown in Figs. 2 and 5 are representative of the straight bar in the Mediterranean. It was observed that the basic profile [1] was remarkably permanent, the mean gradient varying from 1 in 70 to 1 in 250 on barred beaches in the Mediterranean. The bars were found to migrate on this basic profile, although the relation of the water depth over the bar crest to the height of the bar crest above the basic profile in the ratio 2 to 1 (SS′/S′B′ in Fig. 3) appeared to be relatively constant. This fact was later confirmed by model experiments (see p. 80 and Fig. 14). When it appeared that the bar at Moretti Plage was moving faster than that at Douaouda, it was thought that this might be due to longshore currents Fig. 4 explains how this could occur. Had the movement of the curved bar been parallel to the shoreline, the surveys might have shown an apparent movement normal to it (on the section XY). However, a series of profiles surveyed at Moretti Plage showed that the bar movements could not be explained in this way.

At Sidi Ferruch the observations were continued for three months and during this period the outer bar moved considerably. The most interesting movement took place between April 14 and May 1 when it retreated seawards by about 115 feet. This was a period of stormy weather and rough seas, and it is thought that the movement took place during two very stormy days, April 26 and 27. During the calmer weather

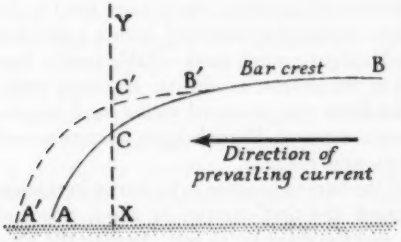


Fig. 4. Plan showing apparent landward movement due to longshore current

[1] The basic or "barless beach profile" is the hypothetical profile resulting from smoothing out the bars (Fig. 3). This is the same as the original profile of the tank experiments. In American literature it is defined as that curve joining the point of zero depth with the troughs of the bars present. This must clearly always be lower than the basic profile as defined above.

there was little movement on the outer bar, although there was a slight but irregular tendency for the bar to move inland.

From these observations, a theory of the formation and movement of the bars was formulated. It was based on two general assumptions; first, that waves which are unbroken move sand towards the land, and second, that under surf waves [1] sand moves seawards. Clearly, in a sea where there is surf there will be a drift of sand from seaward and landward towards the break-point [2] of the waves. The outer bar at Sidi Ferruch probably owes its position to the predominant break-point of the storm waves which are comparatively rare but of great energy, while the inner bar depends on the predominant calm weather waves. Theoretically there should be a slow landward movement under calm conditions when unbroken waves affect the outer bar. On the other hand, under surf waves in storm conditions the outer bar should retreat seawards and the inner bar should be destroyed. The observations confirmed this theory.

Straight bars, South France.—It was realized at the time that observations made in North Africa under war conditions were not sufficiently detailed or

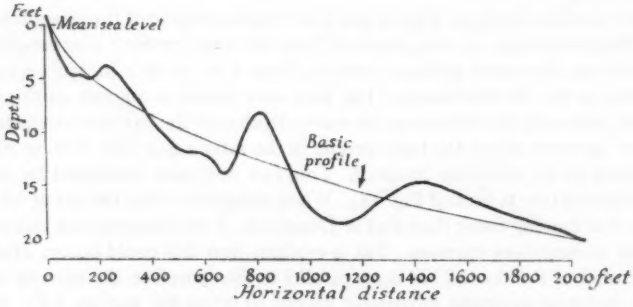


Fig. 5. Beach profile at Les Karantes, South France

reliable to use as quantitative evidence of bar formation and movement. Therefore more recently, in June 1948, a further series of observations on bar movement was made at Les Karantes on the Mediterranean coast of South France. The beach profile was surveyed at least once a day and wind and wave characteristics were observed at the same time. The method of fixing the surveyed points in the horizontal direction was the one used in the earlier surveys, but the depths were obtained by levelling with a graduated staff to a depth of 13 feet. This method gave much more reliable results than sounding. Depths were measured to the nearest centimetre and were probably correct to 2 centimetres. Wind force was measured with a hand anemometer and wind direction by prismatic compass. Wave heights were measured on the graduated staff as the surveys were made.

The surveyed profile is typical of the barred beaches to be found in tideless seas (Fig. 5). Three bars were found, the first covered by about 3 feet of water, the second by about 8 feet, and the third by 14 feet. During the time

[1] Surf waves are defined as a wave system which has several rows of broken waves.
[2] The break-point is the position at which a wave first breaks.

of observation, waves were always small and the middle bar did not move at all, being a long distance to seaward of the break-point all the time. The waves were so small that even the inner bar did not move appreciably. The rare

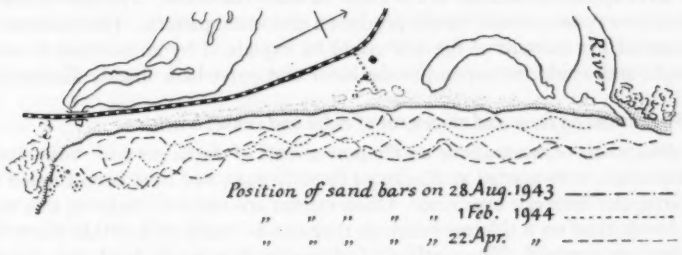


Fig. 6. Movements of crescentic bars in Gulf of Frejus, South France

occurrence of large waves probably also accounted for the fact that the outer bar was not fully developed.

A second section was then selected where the inner bar was in shallower water, the depth over the bar crest being 1 foot. This bar was intermittently under the action of surf, and its movements conformed to the theory of bar movement set out above although the amounts were always small. When waves were breaking on the bar, a slight increase of wave height caused a seaward migration of the bar, while a slight decrease caused a landward movement. The movement of the break-point due to change in wave height explains these bar movements. After a period of calm weather, a sudden increase of wave height caused a new bar to be formed at the new break-point of the waves. A sudden decrease of wave height caused a smoothing of the bar as it came under the influence of unbroken waves.

Crescentic bars.—Crescentic bars are found on many beaches of the Mediterranean, especially those which are enclosed by headlands or deeply embayed (Plate 2). It has been observed on aerial photographs that crescentic bars appear to move more rapidly than straight bars. A possible explanation of this is that all bars may move parallel to the shoreline at an appreciable speed under the action of coastwise currents. This movement could not be detected from air photographs of straight bars, but it would be immediately revealed in successive photographs of crescentic bars (Fig. 6).

As far as is known, no acceptable theory has been put forward to explain the formation of crescentic bars. A possible explanation is forthcoming where a beach is so situated that waves of comparable height come from two predominant directions more or

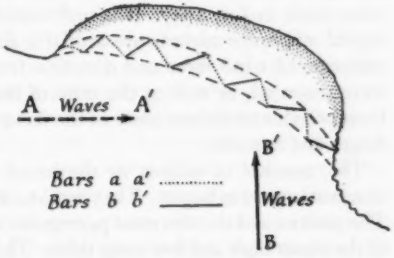


Fig. 7. Theoretical formation of crescentic bars

less at right angles to each other. Fig. 7 shows such a situation. The waves AA′ would tend to build the bars aa′, while the waves BB′ would tend to build the bars bb′. The bars would not all be at right angles to the direction of wave approach because of the effect of wave refraction. The association of these two systems could clearly produce a crescentic pattern. The existence of a second bar seaward of the first could be explained by an increase in wave height and would correspond to the inner and outer bars already discussed.

Observations on form and movement of ridge and runnel beaches

Blackpool.—Observations on the movements of the ridges and runnels on a tidal beach were started at Blackpool in early 1943 and have been carried on at irregular intervals ever since. Observations are easier to make on this type of beach than on a tideless beach as they can be made at low tide when the ridges are exposed. The method of observing changes in level was simple. Two-inch tubular scaffolding poles were driven deeply into the sand to form a line at right angles to the shoreline and clamps were fixed on these at known

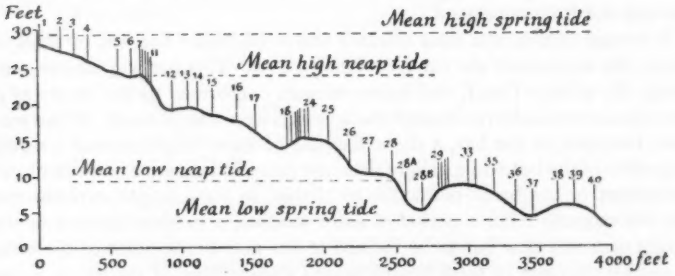


Fig. 8. Beach profile at Blackpool

heights; the changes in sand level were then found by measuring the height of the clamp above the sand surface. Forty-two poles were erected over a horizontal distance of 3900 feet; their relative positions may be seen in the profile, Fig. 8. For a period of six months, from 24 February to 19 August 1943, readings were taken daily at low tide, and weekly readings were taken from 3 December 1943 to 28 October 1944. Since the war further readings were made in July 1947. It is unfortunate however that no precise meteorological and wave records are available for the earlier observations, although estimates of wind force and direction from Squire's Gate aerodrome nearby were recorded, as well as the state of the sea. From this information it has been possible to deduce some of the factors which affect the movements of the ridges and runnels.

The number of ridges on the beach has varied from two to six since observations were begun. They tend to increase in size toward low tide level. The positions of the two most permanent ridges are approximately at the levels of the mean high and low neap tides. This latter ridge has appeared on every profile during the five years of observations and may be considered a permanent feature of the beach. It was observed that the upper parts of the steep

slopes of the ridges facing the sea were of smooth sand, whereas the runnels and landward facing sides of the ridges were rippled. The gradient of the beach as a whole was very flat, being 1 in 150 over the distance covered by the poles. The gradient of the seaward face of the ridges was however considerably steeper, varying from 1 in 32 to 1 in 61 with an average of 1 in 46. The steepest slopes were normally those of the ridges at the top of the beach.

The ridges were found to move considerably with changing weather. It was observed that in rough weather the beach tended to become smoother. Ridge growth generally took place in calmer weather, the ridges developing on areas of very low gradient by accretion of sand. This was usually a fairly slow process taking place over a period of weeks. There were occasions however, usually following a stormy period, when ridges were built up in one or two days. An example of this rapid ridge development may be seen in the profiles for 11 and 19 August 1943 (Fig. 9). The profiles show that there is no systematic landward movement of the ridges. On the whole, those in the lower part of the beach move more slowly than those in the upper part.

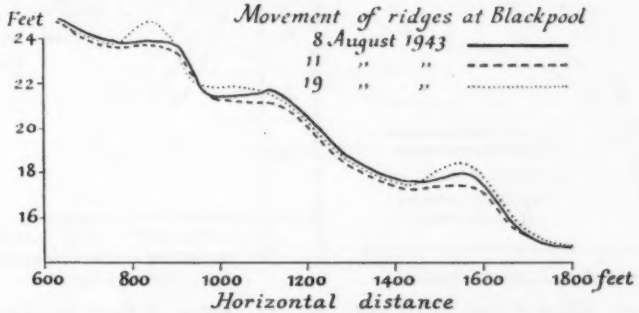


Fig. 9. Profiles at Blackpool showing effect of storm of August 8–11

Drainage channels across the ridges are formed by water escaping from the runnels as the tide falls, cutting away the sand in the process. They also allow the water of the rising tide to penetrate quietly into the runnels while the sea is still breaking on the seaward face of the ridges.

Model experiments on sand movement and bar formation

Sand movement.—The surveys and observations so far described have been made on natural beaches. Under these conditions the number of variables and difficulties of observation are so great that no clear conclusions emerge. A series of experiments has therefore been made in a model wave tank under closely controlled conditions, in order that the importance and effect of different variables might be evaluated, usually one at a time. There are however problems of scale which make it necessary to be cautious in applying the results of model experiments to natural phenomena. For example, the tank is so small that it is impossible to simulate the common natural effect of several rows of surf waves; only one breaker can be made. The results of experiments do however help to explain the formation of bars in the sea.

It is clearly important to know as precisely as possible the conditions which govern the seaward and landward movement [1] of sand on the sea bed. For this purpose a series of experiments was made by trapping sand. The traps were so arranged that the amount of sand moved in either direction could be caught and measured, the difference between the two values giving the net direction and amount of sand transport. Observations were made on three different gradients, 1 in 12, 1 in 15 and 1 in 20, and with a great variety of wave types. The experiments indicated the following conclusions. In nearly all runs, the net direction of sand transport outside the break-point was landward. The amount of sand transported was found to depend on several factors. The most important of these was the proximity of the break-point (or the water depth). As the break-point was approached, the amount of sand

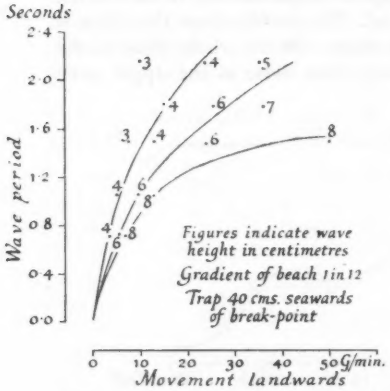


Fig. 10. Effect of wave height and period on movement of sand

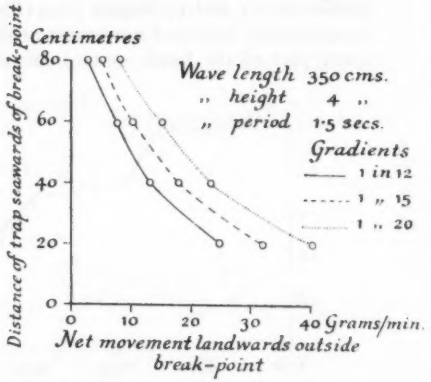


Fig. 11. Effect of beach gradient on movement of sand

moving landwards increased very rapidly, reaching a maximum at the break-point. The effect of wave height on the sand transport was clearly shown (Fig. 10). Outside the break-point the amount of sand transported increased with increasing wave height. A long wave of any given height was also found to move more sand than a shorter wave of the same height. As one would expect, the rate of movement was greater for a flat beach than for a steep one (Fig. 11). In the wave tank, under wave action alone, it was never observed that the bottom material outside the break-point was moving seaward.

When the trap was placed inside the break-point on a gradient of 1 in 12, it was found that in certain circumstances sand moved seawards. The factor governing the direction of movement was the wave steepness (or height-to-length ratio). Fig. 12 shows that a steep wave moves the sand seawards inside the break-point but a flat wave moves it landwards at all depths. The critical steepness under the conditions of the experiment appeared to be

[1] The terms "landward" and "seaward" will refer to the direction of movement of the sand. The terms "inside" and "outside" will be used to refer to the position landward and seaward of the break-point respectively.

about 0·012. Thus inside the break-point the steeper waves were destructive, while the flatter waves were constructive throughout. This has important bearings on the formation of bars in the tank, to be discussed later.

It has been stated that outside the break-point sand invariably moved landwards. This clearly cannot happen in nature, otherwise all beaches would

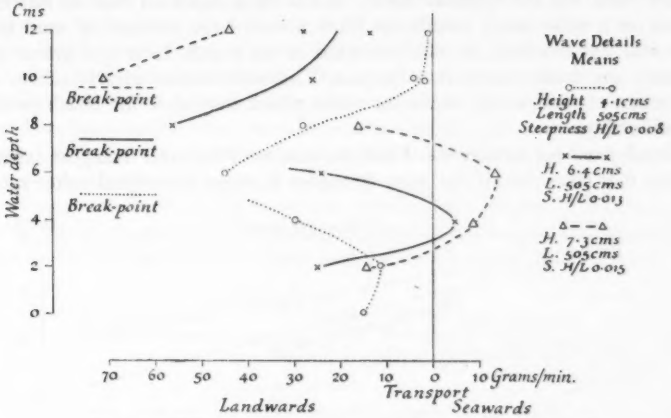


Fig. 12. Effect of wave steepness on movement of sand

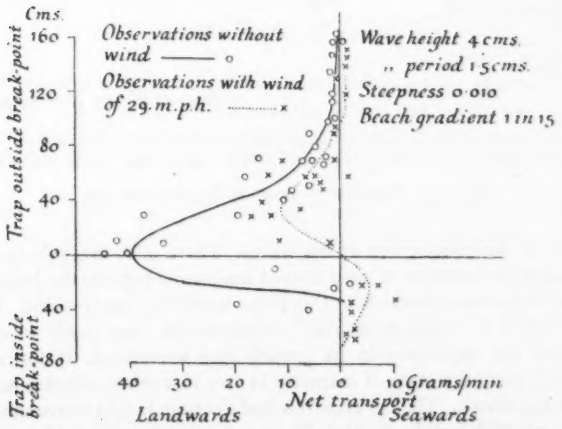


Fig. 13. Effect of onshore wind on movement of sand

tend to grow seawards due to accumulation of sand. There must be a force which on many coastlines counteracts this landward movement of sand, and it was thought that a strong onshore wind might provide it. Such a wind produces a landward movement of the surface water which might be compensated by a seaward movement in the lower layers. Model experiments showed that this did in fact occur. Fig. 13 shows how the landward movement in

deeper water due to wave action is converted into a slight seaward movement by the application of an onshore wind. Inside the break-point a similar effect is clearly shown. This is a condition which must commonly occur in nature, particularly in rough seas when the wind is normally onshore, and it helps to explain how sand can be moved seawards outside the break-point. An offshore wind has the opposite effect. It has been observed that an offshore wind on a wide sandy beach can blow a very large amount of sand into the sea. For example, an offshore wind of 24 m.p.h. blew 312 grams per minute per metre width into the sea. This wind action clearly causes an accretion of sand in the shallower water which may alter the beach profile considerably.

Break-point bar formation.—From the results of the sand transport experiments it is clear that, if the wave steepness is above the critical value, a bar

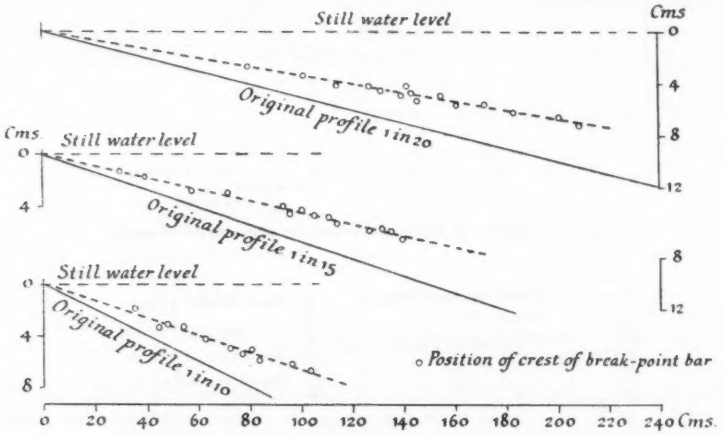


Fig. 14. Position of crest of break-point bar

must form at the break-point of the waves. There is at this point a sudden diminution of the amount of sand moved landwards outside the break-point, while sand is moving seawards to this point inside the break-point. This bar has been called a "break-point bar." Experiments were made to ascertain what factors are important in its growth and movement. It formed very rapidly and reached a state of maturity in five to twenty minutes according to the beach gradient. The bar crest reached a certain height above the original profile above which it did not grow. Fig. 14 shows the position of the bar crest in different runs. It is clear that all points fall on or near a straight line cutting the original profile at the still-water level. It is interesting to note that the depth of water over the bar crest was in all runs equal to twice the height of the bar crest above the original profile. This relation was maintained in all depths and on all gradients used. Since the break-point is dependent on the wave height, it follows that wave height is the governing factor in determining the position of break-point bars and the depth of water over them if the wave

steepness is above the critical value. This critical steepness was found to vary with different beach gradients. As the beach gradient became steeper, the critical wave steepness increased. The more powerful development of the breaker vortex however caused a more rapid bar development on the steeper beaches.

The effect of a change in wave size was also observed in the tank. A large wave, 9 centimetres high and 242 centimetres long, in deep water built a bar at its break-point. A second wave only 3·7 centimetres high and 88 centimetres long then modified the beach. This smaller wave rapidly built a bar in shallower water and left the larger bar undisturbed except for a very slight landward movement—the normal movement outside the break-point. Thus it was found that two break-point bars may exist together if a smaller wave follows a larger wave.

The effect of a change in water level was similarly observed. A rising water level tended to move the bar landward; while a fall in level brought the bar under the influence of the swash and backwash of the broken wave. The

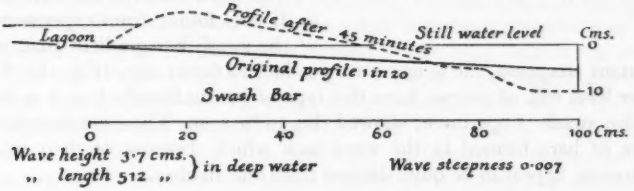


Fig. 15. Profile of a swash bar

original bar was completely flattened and destroyed by this action. A new bar tried to form at the break-point of the waves, but as this was not constant owing to the falling water level, no well-developed bar was formed. It appears therefore that in the tank a break-point bar cannot exist above the still-water level.

Swash bar formation.—Experiments already described show that a flat wave moves sand landwards in all depths. This sand which accumulates inside the break-point was built into a bar by the action of the swash.[1] The bar has therefore been called a "swash bar." Clearly its formation must depend on the wave steepness, as the direction of sand movement inside the break-point depends on this factor. Unlike the break-point bar, it is built considerably above the still-water level to the extreme limit of the swash, forming a lagoon on its landward side. Fig. 15 shows the profile of a swash bar. The swash slope gradient [2] has been made very much steeper by the formation of the bar. The original gradient in these experiments varied from 1 in 10 to 1 in 20, while the gradient of the swash bar varied from 1 in 3·5 to

[1] The swash is the name given to the final uprush of the wave on a beach. The backwash is the return of the swash down the beach.

[2] The swash slope is that part of the beach which is alternately covered and uncovered by the waves. The swash slope gradient is measured from the still-water level to the limit of the swash, expressed as a ratio of height difference to horizontal distance between these two points.

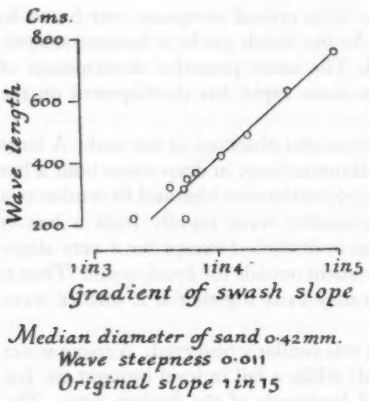


Fig. 16. Effect of wave length on swash slope

1 in 5. Thus, if the wave steepness is below a certain critical value (of the order of 0·02 under the conditions of the experiment) and the original gradient of the beach is flatter than the swash bar gradient, a swash bar will be formed. The ultimate gradient of the swash bar depended on three factors. First, the grain size of the sand, a coarser sand forming a steeper slope. Secondly, the steepness of the waves, a steep wave tending to form a flatter slope, provided it is not so steep that seaward movement inside the break-point prevents swash bar development. The third factor is the wave length. It was found from experiments on the swash bar gradient that, with a constant steepness, the longer wave produced a flatter slope (Fig. 16). Falling water level will, of course, leave this type of bar undisturbed, as it is formed by the swash. Experiment showed this to be true. There are therefore two types of bars formed in the wave tank which, because of their mode of formation, appear to be quite distinct from one another.

Correlation of tank experiments and field observations

Bars in tideless seas.—There seems to be little doubt that the break-point bars produced in the wave tank were formed in the same way as the bars which had been studied in the comparatively tideless Mediterranean. Subsequent observations and tank experiments seem to confirm the early theory of bar development described on page 74. The assumption then made, that unbroken waves are constructive, has since been justified by the results of experiments on the movement of sand outside the break-point. The destructive property of surf waves is less clearly established. It would seem to depend not only on the fact that the wave is broken but also, if the results of tank experiments may be applied to natural beaches, on the steepness of the wave itself. However, the results of this experiment in the tank, where only one breaker can be made, do not appear to apply to rough conditions in nature where there may be several rows of surf waves. It has proved impossible so far to observe the exact action of waves under surf conditions in nature. The effect of wave steepness in bar formation has been clearly demonstrated in the tank, but the importance of this factor in nature is difficult to assess.

The distribution of barred beaches indicates that they are almost invariably found where the fetch of the sea is limited. For instance, they are features of the Mediterranean and Baltic coasts but not, as far as can be ascertained, of Machrihanish Bay (Kintyre) or the coasts of Ceylon where the tidal ranges are comparable. A beach on a great ocean may be attacked by waves of widely varying sizes, so that the prevalence of waves of a given size acting at a given

depth must be smaller than on a beach where the fetch is limited, the range of wave size smaller and the breaker zone narrower.

The theory of the movement of bars and the development of double bars is substantiated by the results of tank experiments, the outer bar being formed by the predominant storm waves and the inner bar by the calm weather waves. The formation of the inner bar was observed in tank experiments to leave the outer bar relatively undisturbed. This result was confirmed by recent observations in the south of France.

Ridge and runnel beaches.—No satisfactory explanation of the ridges and runnels found on some tidal beaches has yet been put forward. There are several reasons for supposing that they are not of the break-point type. It has already been shown that in tank experiments a break-point bar is flattened, if not destroyed, by a falling water level. This bar also requires a constant break-point over an appreciable period of time for its formation; clearly this is not possible under tidal conditions. It is therefore reasonable to inquire whether they could be a series of swash bars. It has been shown that this type of bar may be left undisturbed by a falling water level. The fact that only the upper part of the seaward facing slopes of the ridges is smooth provides a second reason for supposing that ridges are formed by the same agencies as swash bars. The other part of the beach, which is rippled, has clearly not been disturbed by the swash and backwash during the rise and fall of the tide. The swash has however affected the seaward face of the ridges, leaving here a smooth sand surface. In the tank these bars are formed by flat waves; this agrees with the observation that ridges tend to grow during calm conditions in nature. The fact that storm waves, which are usually relatively steep, and strong onshore winds smooth the beach and lower or remove the ridges also tends to support this view. Thus there is good reason to suppose that the ridges are of the swash bar type.

It has been observed that some tidal beaches have a smooth profile while some have a ridge and runnel profile. Two relevant observations may explain this distribution. The first is the importance of the mean beach gradient. The beach at Blackpool is very flat, the mean gradient between tide marks being 1 in 150; this is probably an important condition for ridge and runnel development. It has been shown that a constructive wave whose steepness is below a critical value will tend to build a swash bar. The gradient of this bar will be dependent on several factors (see p. 82). The formation of ridges is therefore believed to be an attempt by the waves to form this gradient on a beach which is naturally much flatter. No such ridge would be formed on a beach whose gradient approximates to the equilibrium value.

The second factor is the fetch at the beach. Ridge and runnel beaches are associated with coasts having a limited fetch. For instance, the beaches on the east side of the Cherbourg peninsula are ridged while those on the west side facing the open ocean are smooth. The beach at Blackpool has a maximum fetch of only 150 miles. A short fetch tends to produce short waves, while a long fetch may produce long swells. The importance of the fetch lies in the average wave length experienced on any beach. Fig. 16 shows that a short wave will build a steeper gradient than a long wave under the same conditions. Therefore, if the fetch is limited and the predominant waves short, the waves

will tend to build a steeper swash slope. On a beach as flat as Blackpool beach, this gradient could only be achieved by bar formation. On the other hand, on an exposed beach where the average wave length is much greater, a flatter slope will be in equilibrium, therefore no adjustment by bar formation is required; the gradient of such a beach may be 1 in 60 or flatter.

This process of gradient adjustment would naturally tend to take place most often at the stand of low and high tides where the water level is relatively constant for an appreciable period of time. At low tide therefore the waves will try to build up a gradient suited to their size by the formation of a swash bar. The growth of this swash bar will obstruct the drainage of the beach, and the runnel will be deepened by the water draining from the beach as the tide falls. As the ridge grows, it protects the beach to landward from the direct action of the waves. The runnel fills quietly with water, thus leaving undisturbed the ripples formed by wave action at high tide. As the tide rises, the sea passes over the lowest ridge and the swash then acts farther up the beach, tending to build a second ridge landwards of the first. This process continues up to the level of high tide where another bar tends to form. The fact that the most permanent ridges at Blackpool, and on other beaches visited, are at low neap tide level and high neap tide level supports this theory of ridge development.

Conclusions

Two types of natural sand bars have been described, the submarine bars of a tideless sea and the ridge and runnel beaches of tidal seas. Experiments in a model wave tank have shown that two distinct types of bars may be formed artificially: the break-point bar and the swash bar. The swash bar is fundamental to the building of sand bars above water enclosing lagoons. The conditions under which these bars form in the tank have been studied in some detail. These results justify a tentative correlation of break-point bars with tideless sea submarine bars, and of swash bars with the ridges found on some tidal beaches. They also help to explain the processes involved in natural bar formation. The observations of sand movement under wave action made on natural beaches and in the tank leave one very important question: namely, the exact mode of sand movement under surf waves. Owing to the scale, it was not possible to simulate surf conditions in the wave tank used, and the observations are difficult to make in nature; the solution may be found only in a larger laboratory tank.

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TWO NOTES FROM CENTRAL ARABIA

H. ST.J. B. PHILBY

THE POOLS OF AFLAJ

AS THE RESULT of an excursion made by me in February 1948 from Riyadh to the Aflaj province of Central Arabia (map facing p. 92), I am now in a position to amplify the description published in my 'Heart of Arabia' [1] of the extraordinary series of "artesian" lakes and ponds which constitute the outstanding feature of the province and which I was the first European to visit in the course of a journey made in 1918. Similar groups of "artesian" reservoirs, more accessible and therefore much better known and more actively exploited in the interests of irrigation, occur in the Hasa and Kharj provinces. In the latter an agricultural task-force of expert farmers from Arizona has for some years been engaged with striking success in developing an experimental farm of about 3000 acres by irrigation from the spring of 'Ain al Dhila', on whose bank a large pumping installation has been established. It is now known that the various "artesian" pools of this province link up underground in a single vast and apparently inexhaustible reservoir. Whether this is connected with the similar pools of the Hasa and Aflaj on either side by a subterranean river, as seems probable, still remains to be established by actual investigation.

The Aflaj pools, more numerous than those of Kharj, are in general of the same character but are distinguished from them by the fact that one forms a lake of considerable dimensions—easily the largest sheet of water in all Arabia. In 1918, when my visit to this area was too rapid to allow of even a rough survey, I estimated the length of this lake at three-quarters of a mile and the width at a quarter of a mile at its widest part. And I must confess that I have often wondered whether the extraordinary nature of this phenomenon had not tended to exaggerate my estimate of its dimensions. A number of Americans have since visited the locality but have not, so far as I know, published any account of these reservoirs. Their silence seemed to provide at least negative confirmation of my description, but I had always hoped to have an opportunity to revisit the spot to check my estimates for myself and to re-examine the problem. I have now realized that hope; and these notes and the accompanying sketch-map (inset in main map) will give readers a better idea of the locality than I was able to achieve thirty years ago.

It was just after sunset on 4 February 1948 that I camped near the south-eastern extremity of the great lake on a shelf of the Ghadhara plateau. This plateau fringes the whole area of the Aflaj province on the eastern side and extends a considerable distance eastward to run eventually under the low escarpment of the Baiyadh desert plain, which in turn extends to the western edge of the Dahna. We had approached by the car-track which runs from the Laila oasis, capital of the province, to the northern extremity of the large oasis of Saih and continues for some 3 miles along the eastern flank of the

[1] Vol. 2, pp. 84-92, 1922.

oasis to its south-eastern extremity, where the extensive medieval ruins of Qusairat 'Ad impinge on its cultivated area. We had travelled some 16 miles in all from Laila by lorry, of which the last 4½ miles lay along the western edge of the Ghadhara plateau from Saih to the lake.

In spite of the lateness of the hour and the rapid approach of darkness, I could not restrain my impatience to check the accuracy of my 1918 estimate of the length of the lake. Accordingly, leaving my servants to settle into camp and prepare dinner, I hastened to the long-since silted-up outlet of the lake at its north-eastern corner and proceeded to pace out the southern line of the lake from that point to its south-western extremity, keeping as close to the water as possible. It was some two hours later, having completed the task, that I turned back to our camp following the easier ground along the edge of the plateau. And when, after dinner, I proceeded to tot up the results of my walk I found that I had walked 3250 paces or about 8125 feet, a little more than 1½ miles! This was eminently gratifying, but I was uncomfortably conscious of an unsolved mystery which would have to wait for daylight to be unravelled. The puzzle arose out of the fact that when I had reached the end of the southern shore of the lake (2450 paces) I turned north for 100 paces and then north-east for 600 paces in the belief that I was returning along the northern shore of the lake. At this point however the shore-line turned south for 100 paces, with thick reeds on my left and the visible water on my right, and brought me back to the southern shore of the lake under the lee of the Ghadhara escarpment. It seemed that there must be two lakes separated by a narrow causeway which I had missed on the outward journey owing to the thick reeds which fringed the water at intervals. And next day this proved to be the case, while a third small patch of water, which I had not noticed in the dark, lay beyond the second, separated from it by a narrow causeway similar to that dividing the two larger ones.

As seen from the higher ground of the little eminence called Al Jabal, from which the lake takes its name, it became clear that the three patches of water originally formed a single lake and had subsequently become divided by the silting up of the fringing reed-beds. On the accompanying inset map, based on my compass traverse of the following day which I devoted to a detailed examination of the whole area of these artesian springs or lakes, it will be seen that the combined length of the three lakes is some 1385 metres or approximately five-sixths of a mile. In former times the whole of the western basin, extending about 1½ miles with a width of about half a mile between the Ghadhara escarpment and the rising sandy ground on the north, must have been occupied by the lake if we may judge from the saline mud and reeds which fill the dry parts of the bottom and from the evidence of a canal, now in ruins, whose off-take at a fairly high level lay a short way to the east of our camp. When this canal fell out of use we have no means of knowing, nor does it seem possible to date the two small groups of ruins on the edge of the escarpment overlooking the great lake, known as Jabal from the high ground on which they stand. Incidentally, the outer cliff of this escarpment has in a number of places collapsed and subsided towards the lake, leaving great yawning cracks in the surface of the plateau, which is composed of a very hard gypseous rock of a dull white colour.

The building on the Jabal hillock is oblong in shape, 25 feet long and about 20 feet broad, and appears to have had a barrel-vaulted roof which has however subsided into the chamber in a tumble of masonry (gypsum blocks). The chamber itself was apparently entered through a narrow slanting passage from the plateau level. It may well have been a tomb, as it is difficult to think of any other *raison d'être* of such a structure in such a place, though the local people do not think it was anything more than a guard post or store shed in the days when the water of the lake was utilized for irrigation. The same remarks apply to the second and more dilapidated structure, situated about 200 yards farther east and perched over a crack in the ground in a badly fissured section of the escarpment. It can only be suggested that these two ruins belong to the same period as the Qusairat 'Ad ruins adjoining Saih which may be tentatively attributed to the epoch of the Carmathians, who occupied much of eastern and central Arabia about the tenth and eleventh centuries A.D. and appear to have made good use of the artesian irrigation of the Aflaj province, as also in Kharj and Hasa. Their withdrawal from the first two may well have been due to the sinking of the water-levels below a worth-while exploitation point, as in both provinces flow-irrigation on a modest scale has been continuously available from some "live" springs. The Umm al Jabal lake (or lakes) is however "dead" in the sense that there is no flow from it and there has been none in living memory. The same applies to the only other spring in the western basin, namely, Bahran in the bay of a big accumulation of sand at its north-eastern extremity. This is a fine-looking circular pit with a diameter of about 100 metres and an old outlet on the north side several feet above the present water level. The canal issuing from this pit no doubt served to irrigate the low ground in the neighbourhood of 'Ammar, a small oasis south of Laila, while the Umm al Jabal distributary already mentioned probably ran down to the area around Qusairat 'Ad or may have linked up with the existing Saih channel which issues from the eastern basin, as we shall see.

So much for the great lake and the western artesian basin. It is separated from the eastern basin by a broad band of sand extending from the Bahran pit southwards to the edge of the Ghadhara plateau. The eastern basin forms a rough oblong some 1550 metres long from west to east and about 500 metres across, bounded on the north, east and west sides by sand strips and dunes of varying elevation, and by the Ghadhara gypsum on the south. In former times these two basins were doubtless continuous and may have contained a single vast lake nearly 3 miles long before the process of desiccation and the encroachment of the sand-strip across its waist created the existing situation. The western third of the eastern basin is a dry reed-covered bottom in which lie two dead spring-pits still containing water but thickly overgrown with reeds. These are both known as Umm al Habbab. Immediately south of the more easterly of the two and nestling against the edge of the Ghadhara gypsum escarpment, a considerable section of which has fallen forward into the water, lies the small lake of Muwafiq forming an oval about 120 metres long and half that width. This is regarded as the "mother" spring of the existing "live" system which still provides irrigation for the oasis of Saih, and it appears to receive quite a strong flow of water from a subterranean source emanating

from the foot of the escarpment at its southern extremity. From its northern end a narrow but strongly flowing canal, bordered by mounds of excavated gypseous earth, runs for some 60 metres to enter another lake known as Wajjaj. This is a considerable patch of water about 400 metres long from west to east and averaging 100 metres wide, lying within high banks profusely covered with reeds. A dead pit called Manjur lies close to its eastern tip, while another nameless dead pond is situated not far to the north, close to the southern extremity of Madsus, the last lake of the eastern basin. A narrow stream, bordered with mud-silt heaps excavated from its bed, links the Wajjaj lake with the opening of the Madsus about 150 metres to the north. The southern part of Madsus is a fair-sized circular basin continued north-eastward by a broad channel to the edge of a high line of sand dunes.

Under this line of dunes lie the openings of the several canals which carry, or (in five out of six distributaries) used to carry, the water of the lakes to the Saih plain. From their summits one can easily discern the lines of the five dead channels splaying out fan-wise to their various destinations, and also scattered mounds of earth and sand covered with desert bushes which are probably the remains of the old cultivated areas. Farther to the east lies the covered channel of the only surviving canal as it emerges from the sand dunes in an easterly direction to turn north-east after a short distance towards Saih. Farther down, this channel branches into two to irrigate different sectors of the Saih oasis, whose owners are volubly apprehensive lest any project for reviving the ancient glories of this once extensive irrigation system might adversely affect the amount of water now reaching their fields and palm-groves in the surviving canal. The experience of Kharj, where several thousands of acres have of recent years been brought under cultivation by exploitation of similar artesian springs on modern lines, should be sufficient to dispose of such fears; but it is certain that in due course the vast water resources of the Aflaj province, at present neglected owing to its distance from the main centres of development, will be tapped by modern methods in the interests of agricultural expansion. The output of the eastern basin could be enormously increased by the erection of pumps, like those used in Kharj, on the bank of the Muwafiq lake; while even greater possibilities are suggested by the use of such pumps on the great lake with its superficial water area of some 200,000 square metres and of great though yet unknown depth. The three lakes of the eastern basin are probably deeper owing to less silt accumulation in their beds, though their combined superficial area of water is not much more than 80,000 square metres. And in addition to these two basins there is another group of less imposing springs at the edge of the Ghadhara plateau some 10 miles to the southward. A number of small oases, extending from Ghauta and Suwaidan in the north to Sadda and Banna near Badi'a in the south, derive their sustenance from them and would doubtless prosper greatly if pumping were introduced.

I will here add a few remarks about the ruin field of Qusairat 'Ad, the general shape of whose periphery is shown in the inset-map. Apart from two rather fine and massive square towers of clay and the ruins of what must have been an imposing gateway on the west side, there is nothing very remarkable about the remains of this once large town. The complete absence

of broken sherds from the whole area, at least on the surface, is rather striking. And so far as I could ascertain during a search of two hours, the area provides no other clue to the identity of the builders and occupants of the town or even to its original name. I have already suggested that it may be attributed to the tenth century, but it certainly cannot be regarded as going back to the days of the famous tribe of 'Ad.

THE QARIYA RUIN FIELD

About 70 kilometres south of the point where wadi Dawasir cuts through the barrier of Tuwaiq a similar channel, called Fau, divides the southern section of the same barrier at what is in effect the north-western corner of the Rub' al Khali, whose sands almost impinge on the western escarpment of Tuwaiq south of this point and shepherd the drainage of the Fau channel (under various local names) north-eastward into wadi Dawasir in the neighbourhood of the Rammak sands. About 150 kilometres south of the Fau channel, according to information supplied by a survey party of the American Oil Company operating in this area, the Tuwaiq barrier is again split by a wide sand-covered gap (approximately 40 kilometres), impassable to motor vehicles, which presumably represents the combined channels of wadi Najran and wadi Habauna. A farther 75 kilometres, as seen from the air by the same survey party, brings one to the southern extremity of the Tuwaiq escarpment, around and beyond which the sands maintain undisputed sway down to their southern edge, as shown in the International 1/M map.

At this southern tip of Tuwaiq, 120 kilometres east of Najran, there are said to be extensive ruins of an ancient settlement with wells and inscriptions whose existence was reported to me when I was at Najran in 1936 [1] and confirmed to Wilfred Thesiger, under the name of Mankhali,[2] during his great trek across the western Rub' al Khali early in 1948. If these ruins prove, as they probably will, to be a Sabaean settlement, they will provide evidence of Sabaean penetration into the interior of Arabia, presumably for the protection of trade routes and communications with the eastern settlements (Bahrain and Hadhramaut). The wells at Mankhali evidently represented a stage on the road from Najran to Hadhramaut, and the colony established there was no doubt intended for their protection.

We have no evidence of any such settlement in the 40-kilometre gap of the Mundafan tract; but farther north at Qariya (or Qariyat al Fau as it is generally called), a mile or two west of the Tuwaiq escarpment at the opening of the Fau channel, there is unmistakable evidence of the existence in the past of a considerable settlement based on a single well with plentiful but slightly brackish water at 15 or 16 fathoms. I had often heard of these ruins, but it was not till February of this year that I was able to give effect to my plan of visiting them. The sensation caused at Riyadh by Thesiger's dramatic arrival at Sulaiyil from the other side of the Rub' al Khali provided my opportunity. I obtained the King's permission to go down from Riyadh to meet him; and having duly done that at Laila in the Aflaj, I continued my

[1] Philby, 'Sheba's daughters,' p. 430, 1939.
[2] See p. 34 of this *Journal*.

journey southwards by car, mainly over my route of 1918, to Sulaiyil, whence I went on to Hassi, and up the Fau channel to Qariya. Thesiger had been very near the latter when he emerged from the Rub' al Khali but had not visited it; but the American survey party mentioned above had been there frequently and had left me little to discover, though the results of my own examination of the site may be of interest in the absence of any other publication on the subject. Unfortunately, owing to the incompetence of my guides, I missed visiting the tiny but very conspicuous hillock of 'Ubaid in the middle of the Fau channel where the Americans had found some inscriptions and other interesting indications of a ceremonial character. They had also found on the well and removed a finely carved Sabaean inscription on a tomb headstone. On the other hand, I was able to find a further group of inscriptions on the façade of a tomb, partially cleared of the enveloping sand by treasure-seeking Arabs. These are being published by Dr. Ryckmans of Louvain University in a forthcoming issue of *Le Muséon*, and appear to suggest Lihyanic rather than true Sabaean affinities. It is probably no more than a coincidence that the name of one of the prominent headlands of the northern section of Tuwaiq in this neighbourhood is Lihyan.

These inscriptions however are generally of a trivial character, while the ruins of the town with which they are associated are of considerable interest as the first evidence yet found of the existence of a Sabaean community in the interior of Arabia. Subject to confirmation, some of the fragments of pottery found by me on the surface among the ruins (and now in the British Museum) suggest the possibility of a date around the second century B.C., while one is a chip of a well-known type of Phoenician bowl, to which undue significance must not be attached. The settlement was probably abandoned on the collapse of the Sabaean régime, but the remains of a mud-built fort and several turrets on the eastern edge of the older ruins suggest that the site may have been partially reoccupied in medieval times (possibly the Carmathian period) as a guard-post on the well.

The latter is situated near the western edge of a considerable tract of hard white gypseous rock, which rises gradually eastward and northward towards the Tuwaiq escarpment and is bounded on the west by a semicircular barrier of sand, extending across the wide mouth of the Fau channel from the southern to the northern section of the escarpment. The gypsum provided both a firm foundation for the settlement and the material out of which its houses and tombs were built, while the circular shaft of the well was sunk in a bluish limestone to the depth already indicated. Sand and animal droppings have combined in the course of time to raise the now pentagonal mouth of the well about a fathom above the level of the bed-rock in an oval barrow of considerable proportions. The motor track from Riyadh to Najran passes through Qariya, whence it strikes across the sand barrier mentioned above ('Arq abu Rumh) in a south-south-west direction to the wells of Hima.

The ruins cover a considerable area with a somewhat irregular circuit, and it is not very easy to determine whether the settlement was walled about or not, though it is quite clear that the well must have been outside the wall if there was one. On the other hand, some of the ruins vaguely suggest groups of fortified mansions, while many of them are unquestionably tombs

of some character. Only the archaeologist's spade can reveal the true significance of this group of ruins. Meanwhile casual Arab visitors to the well will continue their tentative probing into the ruins in search of treasure. In one case, at any rate, their activities have resulted in the clearing away of a considerable amount of sand from the front and one side of a small building which is evidently a tomb. Its arched entrance is cut in the north-west face of a deep rectangular pit, while above it is a deeply recessed alcove. The whole face of the tomb is covered with inscriptions, lightly incised in a thin layer of gypsum plaster which would seem to have covered all four sides of the tomb. The occurrence in the inscriptions of several names apparently linked together in some common relationship suggests that the tomb was a family mausoleum. The local Arabs know it as the *sardab* or subterranean summer chamber. If cleared of the debris which envelops it, the tomb would be about 8 feet high and about a dozen feet square. It is possible that its contents have remained undisturbed since its last occupant was interred.

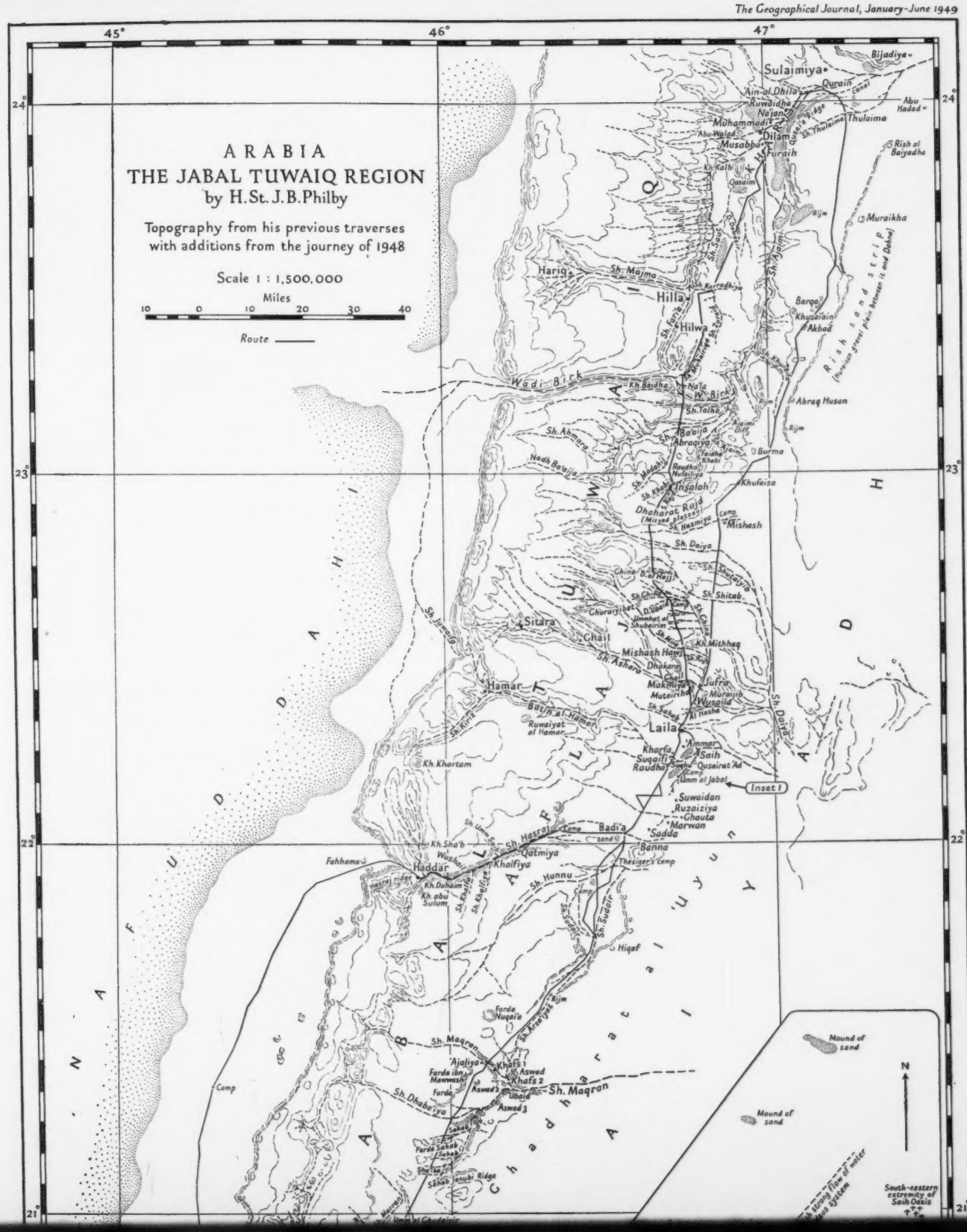
Another grave which I examined has evidently been rifled of its contents, as one or more of the large limestone slabs covering its mouth have been removed. Blown sand has filled up part of the cavity, whose original depth would seem to have been about 8 or 9 feet. It is 8 feet long and about 3 feet wide (interior measurements).

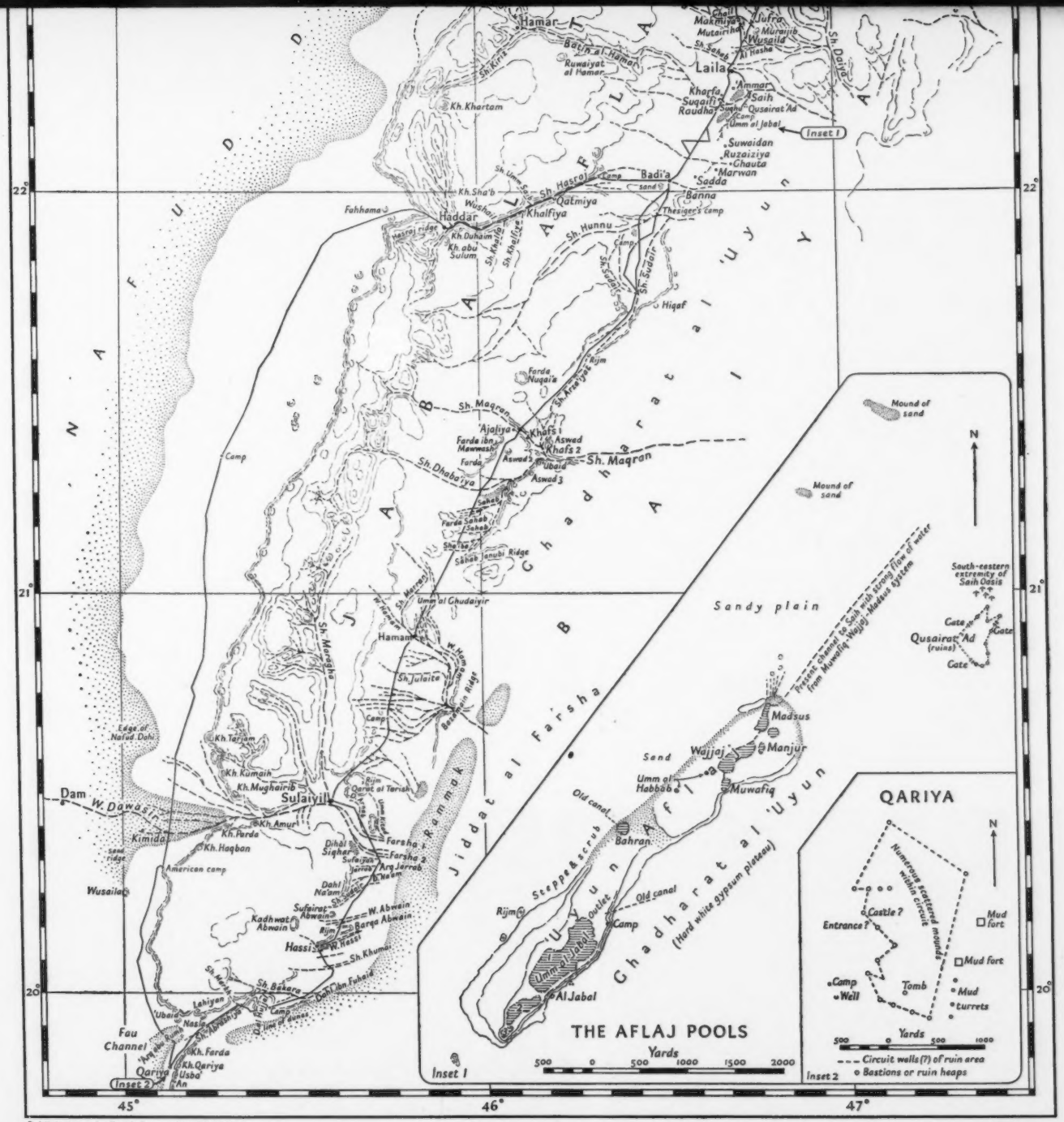
Some large mounds near the western edge of the site appear to have been the principal building of the town, possibly a castle or palace of the chief. Scattered masonry in front of them seems to represent a stepped approach to this important mansion from the lower ground on the western side of the town. Two rectangular ruins may be either the roofs of tombs or the foundations of dwelling houses, probably the former. A line of such remnants, lying east and west, comprises five distinct units: three of these at the eastern end each measure 10 by $7\frac{1}{2}$ feet; the next to the west measures 20 by 10, and the terminal building $17\frac{1}{2}$ by 10 feet. This is almost certainly a group of graves of a single family.

It is to be hoped that these notes will be sufficient to enable the experts to form an idea of the archaeological possibilities of the site, which covers a considerable and somewhat irregular area, roughly oriented north-north-east and south-south-west, as shown in the tentative sketch-map (inset). It has all the appearance of having been but little disturbed by treasure seekers in modern times; and it may well contain much information of importance to the historian of ancient Arabia. The steadily growing interest of the Arab countries in the remains of their ancient civilization, and the recent formation of a cultural sub-committee by the Arab League, suggest that the examination of this and other sites in Sa'udi Arabia by expert archaeologists may become possible in the not distant future.

Note on the map

The map of the Jabal Tuwaiq region on the scale of 1/1,500,000 was compiled from sheets prepared by Mr. Philby from his compass-traverses made in 1948, on the scales of 1/200,000 and 1/500,000, and incorporated with details from the Laila and Riyadh sheets of the Asia 1/M series. The route from Qurain to Laila runs eastwards of Mr. Philby's 1918 route as far as Wusaila, then more or less follows the earlier route through Badi'a to Khafs, leaving it


ARABIA
THE JABAL TUWAIQ REGION
by H. St. J. B. Philby
Topography from his previous traverses with additions from the journey of 1948
Scale 1 : 1,500,000
Miles
10 0 10 20 30 40
Route
45°
46°
47°
24°
23°
22°
21°
Sulaimiya
Bijadiya
Qurain
Abu Hadad
Ain al Dhila
Ruwaidha
Najan
Muhammadi
Dilam
Musabba
Furaih
Thulaima
Rish al Bayadha
Muraikha
Hariq
Hilla
Hilwa
Barqa
Khusaifain
Akbad
Abraq Husan
Burma
Khufeisa
Mishash
Sitara
Chail
Hamar
Laila
Jufra
Murajib
Wusaila
Suwaidan
Ruzaiziya
Ghauta
Marwan
Sadda
Banna
Badi'a
Haddar
Khalfiya
Qatmiya
Fahhama
Hiqaf
Farda Nuqai'a
Ajaliya
Khafs 1
Khafs 2
Farda
Aswad 1
Aswad 2
Aswad 3
Sh. Maqran
Sh. Dhabatiya
Inset 1
Mound of sand
Mound of sand
N
South-eastern extremity of Saih Oasis
Wadi Birk
Nafud Udd Dahi
Jaulan Dahi
Nafud al 'Uyun
Rish sand strip
(Increase gravel plain between it and Dahna)
Tuwaiq Ridge
Sh. Majma
Sh. Karradhiya
Sh. Jubaila
Sh. Talha
Sh. Ahmara
Nadh Bawija
Dhahrat Rojd
Sh. Daiya
Sh. Shitab
Sh. Jawasia
Sh. Ashara
Sh. Kirra
Batn al Hamar
Ruwaiyat al Hamar
Kh. Khartam
Sh. Hasra
Sh. Hunnu
Sh. Sudairi
Sh. Araiyat
Sh. Maqran
Sh. Dhabatiya
Sahab
Farda Sahab
Sahab Janubi Ridge
Thesiger's Camp
Camp


Hamar
Laila
Haddar
Qatmiya
Khalfiya
Badi'a
Banna
Sadda
Suwaidan
Ruzaiziya
Ghauta
Marwan
Inset 1
Sulaiyil
Dam
W. Dawasir
Kimida
Wusaila
Hassi
Fau
Qariya
(Inset 2)
Sh. Maqran
Sh. Dhabatiya
Sh. Julaita
Sh. Marqaha
Sh. Khumal
Sh. Bakera
Sh. Hunnu
Sh. Hasroi
Sh. Dawasir
Sh. Kiraa
Sh. Sahab
Sh. Suqaifi
Sh. Sudair
Sh. Khalfiya
Sh. Umm Sa'
Sh. Marzig
Sh. Mu'ath
Sh. Abwain
Sh. Mu'ajjil
Sh. Marmar
Sh. Hamam
Sh. Mughairib
Sh. Amuri
Sh. Farda
Sh. Haqban
Sh. Kumaih
Sh. Ta'jam
Sh. Sahab Janubi Ridge
Sh. Sahab (Sahab)
Sh. Sha'ba
Sh. Duham
Sh. Abu Sulum
Sh. Khalfiya
Sh. Hasroi ridge
Sh. Maqran
Sh. Arnaziya
Sh. Sudair
Sh. Hasroi
Sh. Umm Sa'
Sh. Sha'b Wushai
Sh. Hunnu
Sh. Khalfiya
Sh. Marzig
Sh. Mu'ath
Sh. Abwain
Sh. Mu'ajjil
Sh. Marmar
Sh. Hamam
Sh. Julaita
Sh. Khumal
Sh. Bakera
Sh. Dahl Fahaid
Sh. Lahiyan
Sh. Nasla
Sh. Abu Shiya
Sh. Kiraa
Sh. Sahab
Sh. Dawasir
Sh. Sahab
Sh. Hasha
Sh. Dawasir
Sh. Sahab
Sh. Suqaifi
Sh. Sudair
Sh. Hunnu
Sh. Hasroi
Sh. Umm Sa'
Sh. Sha'b Wushai

for a parallel course to westwards as far as Hamam and returning to it from here to Sulaiyil.

From Sulaiyil to Qariya Mr. Philby broke new ground, turning northwards and meeting his earlier route near Kimida. From Kimida to Haddar, visited in 1918, the route crosses the plain between the escarpment of the Jabal Tuwaiq and the sands of Nafud Dahi, and follows the course of Shails Hasraj to rejoin the southward route at Badi'a. From Wusaila the route takes a course roughly midway between the eastern and western tracks of 1918 as far as Furaih, whence it follows the earlier route to Qurain and Sulaimiya.

Distances during the journey were recorded by motor-car speedometer.

PEOPLE AGAINST THE LAND

ROAD TO SURVIVAL. By WILLIAM VOGT. *London: Victor Gollancz*, 1949. 9 × 5½ *inches;* xvi + 335 *pages; diagrams.* 15*s*

MR. VOGT'S book has made a great stir, both here and in America, and it was his intention that it should. Perhaps that is the explanation of its exaggerations and inconsistencies, its apparent complete disregard of human values. For he sees the Americans as a group of shipwrecked men who have climbed on to a well-provisioned raft and whose first business should be to fend off the clutching wretches still in the water. He deems a high death rate the greatest of blessings ("All the more for me!"); doctors are public enemies; the tsetse-fly ranks as one of Tanganyika's prime assets. He hopes that the British withdrawal from India will re-introduce Malthusian checks on population—famine, disease, civil war. The Japanese may expect an honoured place in the comity of nations only if they reduce their numbers to the approximate figure of Scandinavia; that is to say from about seventy millions to ten. Yet he does not advocate mass slaughter, so that it is difficult to see quite how the Japanese are to manage it. His one positive suggestion is that American aid to reconstruction should be made contingent upon an active policy of birth-control on the part of the recipients, whom he views as slyly dipping their hands into his compatriots' dinner-pail.

But leaving all this harmful nonsense aside, what is his general thesis? It is this. After centuries of relative steadiness the population curve of the world has steepened upwards alarmingly and is taking on a runaway angle. At the same time, and again after a long period of stability, the world productivity curve has steepened downwards alarmingly and again threatens a runaway tumble to disaster. In other words, an expanding population is pressing upon a diminishing area of cultivable land. From every available source (and he is careful to give his references) Mr. Vogt gathers the reports of soil erosion, gullying, overgrazing, deforestation, lowering of the water-table, and every other form of destruction of fundamental resources which has arisen from the greed, ignorance and carelessness of mankind.

To geographers this sorry tale is familiar enough, but fortunately they are familiar also with the tale of conservation and betterment and are unlikely to agree to sponsor an organized attack upon human fecundity. Yet they know that mankind is in very grave danger and they will be at one with Mr. Vogt in tracing this danger in part at least to the domination and government of the

world by the city-bred, by men of urban and not of rural outlook and inspiration; and this is true even in predominantly peasant states. Their politicians are men of the towns, whose education has been devised by men of the towns, and every traveller must have noticed the mental as well as the material gap between the westernized towns and the primitive squalid villages in such communities. Had a townsman framed the Lord's Prayer the petition would have been not for "daily bread" but for daily money income. Even the experiences of our own country since the war have not driven home the lesson that it is not more money but more production that leads to prosperity. The intimate biological relationship between man and the earth, the delicate balance of forces which keeps the land in "good heart," the lesson to be read in many a wild scene that there can be perpetual abundance if correct relationships and balances are unimpaired—all this is remote and meaningless to the town-bred man, and indeed to many country dwellers whose schooling derives from generations of the "urbane."

True that administrators are turning increasingly for help to science, but they are unable to judge critically of a scientific proposal. And it is too often the case that the ultra-specialization of modern science and the insistence of the scientist that his work shall be "pure" makes him unfit to advise upon, still less to undertake, any great practical project. It is an excellent thing that our politicians realize that education is improved by raising the standard of child nutrition. But danger to the whole world will not be averted until they think beyond the school meal to the crops and stock that have provided its ingredients, and beyond the crops and stock to the sun and soil and water from which they spring. Fortunately neither greed nor neglect nor ignorance can impair the sun. But of the other two this is not true.

Mr. Vogt's violence of overstatement will have its uses if it reaches the townsman's ear, so inured to noise and excitement. And it is worth noting that he himself has discovered one bright and hopeful spot in the world where construction and not destruction is the order of the day. It is in Palestine!

E. G. R. TAYLOR

LANDSCAPE IN THE MAKING

LANDSCAPE: as developed by the processes of normal erosion. By C. A. COTTON. (2nd ed.) *Christchurch, N.Z.: Whitcombe and Tombs*, 1948. (*London: Cambridge University Press.*) 8×5½ *inches;* xiv+509 *pages; diagrams and illustrations.* 47*s* 6*d*

ALTHOUGH this is the second edition of a book first published in 1941, the fact that the original text has been partly rewritten and increased by more than 250 pages, and the illustrations greatly added to, means that it is virtually a new publication. As indicated by the sub-title, the book deals with the sculpturing of the land by the processes of normal erosion. It forms one of a trilogy on landscape forms, of which 'Climatic accidents in landscape making,' dealing with sculpture under arid and glacial conditions, and 'Volcanoes as landscape forms' were published in 1942 and 1944 respectively.

Professor Cotton follows W. M. Davis in using the term "normal" to refer to pluvial and fluvial processes operating in the humid climates of the cool temperate zones, although he extends the connotation of the term to include such processes as they act in the tropics (pp. 237 *et seq.* and chap. 23 *passim*). The "special" processes—aeolian, glacial and marine—are deliberately excluded from this book, as is discussion of interruptions of the geomorphic cycle brought about by the "accident" of vulcanism in any of its many manifestations.

One can have no hesitation in proclaiming this to be a first-class book. The wide field covered, the clarity of style and fundamentally scientific presentation, together with the wealth of illustrations, offer the student in geology and geography the soundest possible survey of a very difficult and subtle branch of geomorphic study. As the author states in the preface, the general reader has also been borne in mind; but I suspect that the logical development of the subject, necessitating a sustained intellectual effort on the reader's part, will limit his interest to the illustrations.

Professor Cotton's treatment is thoroughly Davisian in character both in its fundamental conception of the ideal geomorphic cycle based on structure, process and stage, and in its method of confronting the results of deductive reasoning with the concrete evidence of field examples. It need hardly be said that he takes fully into account contemporary developments of Davis' theories and carefully discusses the merits and inadequacies of rival hypotheses when examining important problems, as is well shown in the chapter on limestone caverns. Excellent and notably international bibliographies are appended to each chapter, and there are several references to articles published as recently as 1947. New Zealand provides the majority of examples of landforms discussed. No apology is needed for this, so excellent are these examples and so refreshing is it to see others than the classical ones.

A valuable feature of the book is that all geomorphological terms where used for the first time are given in italics and are clearly defined. (The new term "transcurrent faulting" has accidentally been used twice, on p. 90, line 5 and on p. 404 in the description of Fig. 305, before being defined on p. 412; and "monadnock" is defined by implication in a quotation on p. 84 before appearing deliberately on p. 273.) The reader however is expected to be acquainted with many of the commoner purely geological expressions such as "granite batholith," "homoclinal tilting," "overthrust," "tectonic," as well as with the geological time-sheet.

Professor Cotton first discusses the mass movement of waste and most wisely gives this question considerable space; although a somewhat detailed account of sub-arctic and periglacial phenomena (*e.g.* solifluction) seems perhaps out of place in a book on "normal" erosion processes. After explaining the general aspects of rain and river erosion, the initiation of an erosion cycle in an ideal, simple case is discussed; and here great care has been taken to show how ideal and how simplified such a case, used solely to explain the general conception, really is. There follows a pertinent chapter on lakes resultant either upon hollows in the initial surface or upon various types of "accident," for example landslide lakes.

The next chapter deals with the longitudinal profiles of graded streams and with superposed streams. The discussion of grade is the only one in the book that is somewhat confusing, and this is unfortunate, since the subject is of fundamental importance. To the student approaching the question for the first time it must surely be made quite clear initially that the problem under discussion is that of equilibrium slopes in a longitudinal sense; that in any longitudinal section of a stream course there is interplay between load (mass-calibre) and energy (volume of water and its velocity); that when the energy is sufficient to take a greater load than that offered it, vertical erosion ensues—and aggradation when the reverse conditions obtain; that the expression "graded" is used of a slope such that load and energy are in equilibrium on it. The student will at once realize that, with varying load and volume in different sections of the stream, slopes when graded will vary locally in declivity, and that the longitudinal profile of a graded river is the integration of innumerable graded sections having different angles of slope. He will then be in a position to work out for himself the profiles that are likely to be exhibited by rivers in which all sorts of variations in load and volume occur in different sections, and so find, incidentally, that profiles showing regularly decreasing slopes from source to mouth must prove exceptional cases. Now unfortunately the introduction to this subject in the book (pp. 72–5) begins with a figure showing this exceptional case; continues with a discussion of slope and *volume* of water; then confuses the student by bringing in Bain's mathematical conception of a stream not working to base-level. Then comes the bald statement, quoted from Davis, "A stream that has attained the minimum slope under existing conditions is said to have reached grade." Since the student is so far uncertain what "existing conditions" comprise and what their exact relationship to "minimum slope" is, this statement is valueless to him. But enough has been said to make clear that in the reviewer's opinion this section needs drastic revision as regards presentation.

Next come chapters on the landscape in youth and maturity, on shifting divides and river piracy. River invasion in its less spectacular aspects is dealt with; but in view of the fact that many celebrated cases of "capture" (*e.g.* that of the Niger by a tributary of the Benue) are now under grave suspicion of being in reality cases of diversion through alluviation, it might have been worth while alluding to this question. The famous Toul "capture" shown on p. 111 is considered by both Baulig and Briquet to be due to invasion, although the mechanisms envisaged are different.

Chapter 9 deals excellently with subsequent erosion on folded rocks, attacking the real problems and eschewing the "standard" facile presentation that does not even notice their presence. Homoclinal features and structural benches, transverse valleys, lateral corrasion and river terraces are all most ably discussed in separate chapters. The important and thorny question of the effect of changing climatic conditions on terrace formation, with its many imponder-

ables and hypotheticals, is wisely given considerable space. One might venture to suggest that the statement on p. 206, "A fair degree of agreement of terrace patterns, if found in separate valleys, points to a climatic as the only probable general cause of terracing," is debatable. Indeed, the meaning of "a fair degree of agreement of terrace patterns" is far from clear. The statement on p. 193, "All river terraces are definitely features of *landscape* youth," is hardly acceptable as it stands.

Landscape maturity and peneplains are each allotted chapters, separated by another on constructional landforms. That on landscape maturity is particularly valuable, with somewhat detailed discussion of valley slopes, ridges, convex profiles and of the heretical theories of Walther Penck that die hard. Incidentally, I do not think the statements under "Slope retreat" on p. 231 are as obvious as the author believes; a diagram or a mathematical note would help.

Three admirable chapters follow: "Resurrected fossil landscape surfaces" with the warning, reiterated from the previous chapter, that probably all well-preserved, non-exhumed peneplains are of geologically modern origin; "Effects of uplift and upwarping," and "Positive and negative movements of base-level," the latter dealing, inter alia, with polycyclic valleys and landscapes and with Walther Penck's fallacious theory of piedmont-benchlands. The penultimate section of the book devotes three chapters to a discussion of "Block-faulted landscapes," "Fault-scarps and earthquake scarplets" and "Some fault and fault-line features." In some 80 pages the author manages to give a most comprehensive picture of this subject and, to the best of the reviewer's knowledge, presents an incomparably more detailed and altogether superior discussion of fault-scarps (in Chapter 21) than any to be found in a general textbook. The last two chapters are devoted to "Limestone landscapes" and "Limestone caverns." Stress is put, in these excellent accounts, on the various hypotheses which have been advanced by morphologists to explain karstic phenomena.

The photographs, the drawings and diagrams are all of very high standard. Special mention should be made of the fine air-photographs taken by V. C. Browne. There is a detailed index and useful cross-referencing in the text, and the whole is printed on good glazed paper. The book is an achievement to be proud of and further editions will certainly be called for.

JOHN B. HANSON-LOWE

REVIEWS

EUROPE

THE LAND OF BRITAIN: its use and misuse. By L. D. STAMP. *London: Longmans, Green*, 1948. 11 × 8½ *inches;* viii + 507 *pages; maps and diagrams.* 42*s*

This book is the account of the Land Utilization Survey. Professor Stamp was Director of that great work; he gave to it the continuing inspiration and guidance which brought it to a successful conclusion. Now he has given us a brief history of the Survey, a concise summary of its results and a statement of some of the conclusions to which it has led him. The magnitude of the work is suggested by the fact that this volume has 500 quarto pages of text, figures and tables, yet is essentially a summary record. As such it is invaluable.

The scope of the work is perhaps best indicated by the chapter headings. Chapter 1 is the "annals" of the Survey; Chapter 2, a general review of its map notation and the facts recorded on its maps. The research involved in the preparation of the 92 reports on counties, or groups of counties, which supplement and amplify the maps to make a full account of the use of the Land of Britain at the time of the survey (1931–38), is the basis of Chapters 2 and 3; while Chapters 4 to 9 record the distribution of particular types of land use over Britain as a whole, leading up to the distribution of settlements in Chapter 10, and a study of "Access and accessibility as factors in the use of land" in Chapter 11. The next chapters discuss geology and physical geography in relation to land use.

It was fortunate for Britain that the actual survey was completed before the war of 1939–45, though the publication of its results had only been begun. Its obvious value in the wartime economy made its completion a national necessity. And in spite of the difficulties of the time, and damage by enemy action, it was carried to a triumphant conclusion. Moreover it was supplemented by a survey of types of farms; and the addition of this and some other work enabled Professor Stamp to make the preliminary study of fertility, productivity and classification of land here recorded in Chapter 17.

A supplement to these surveys is the extremely valuable record of "Wartime changes in land use, 1939–45" (Chapter 19), a section which might well be amplified for the benefit of planners and future historians. Finally the author sets out "Some basic principles of land use planning" (Chapter 20) which this work has enabled him to formulate, and in the last chapter (21) he estimates how far these principles are accepted in the movement "Towards national planning, 1941–46."

The Land Utilization Survey is probably the greatest contribution to our knowledge of Britain made by the present generation. It is also a principal contribution to geographical knowledge; and it has stimulated a great deal of research work. It has fully demonstrated the necessity of such geographical work for knowledge of our natural and human resources, and so for any sound planning of the use of those resources. It is, of course, mainly concerned with the use of rural land, though much of its method is applicable to urban areas. But it has many relations to the movement for town planning which has developed so strongly within the last fifty years, and not the least of its achievements is that planners now talk of town and *country* planning; and the more

advanced of even the town planners are realizing that the country is not merely a place in which towns are, or may be, built. War and post-war experiences have led to a wider realization, among our town-bred populations, of the vital importance of the rural lands which are the site and the raw material of the basic industry of food production. In guiding the urban majority of our population towards a wise use of the land, the work of the Land Utilization Survey and the widest possible publication of its results are of prime value.

The volume is well illustrated and well produced. It could be improved by further careful proof reading for the second edition; there are also many places where some slight emendation of the phrasing would give greater clarity and smoother reading. Its value to all who are interested in the geography and history of Britain, and to all planners, is such that no serious library can afford not to have it. The author, and all the workers recorded here who have contributed to the Land Utilization Survey, have deserved well of their country and have made a great contribution to human knowledge. C. B. F.

CONURBATION: a planning survey of Birmingham and the Black Country by the WEST MIDLAND GROUP. *London: Architectural Press*, 1948. $11\frac{1}{2} \times 8\frac{1}{2}$ *inches;* iv+288 *pages; maps, diagrams and illustrations.* 30*s*

The word used as the title of this book was coined by the late Sir Patrick Geddes. It appeared in his 'Cities in evolution' (p. 34) in 1915 as a new name for a city-region, an area largely occupied, and wholly dominated, by a group of large towns. In 1932 the word was used by the present reviewer in this *Journal* (79 (1932) 100) in a strict sense, to indicate "a continuously urban area." That article had a very wide circulation and the reviewer has often been charged with the invention of the word, though only by persons who had not read the article with any care. But, as with many other terms, wide use has been accompanied by loss of precision and it has for most people only a vague meaning. In this book it is used to denote the area of twenty-four urban districts grouped for the purpose of the survey. The area differs from that of the conurbation of "Greater Birmingham" of 1931 by including Aldridge and Solihull urban districts, which were in 1931 still officially rural. Most of the then rural district of Kingswinford has also been absorbed. Other changes of name are due to amalgamations or absorption of some urban districts within the conurbation. This use of local government areas has the great advantage of permitting the direct use of official statistics; but it is a change from the earlier use of the term "conurbation."

The map-diagram on page 14, which precedes Figure 1, shows this West Midland conurbation in its position relative to six other major conurbations of Great Britain and to the five counties of the West Midlands which form the "region" studied by the Group. On it the Clydeside conurbation is badly misplaced, and three others are not quite correctly placed. The eighth is not shown, perhaps because in 1931 the spread of Nottingham and Derby, and the smaller towns in the Erewash valley between them, had not quite linked up what had become, by 1939, one Mid-Trent conurbation and is now clearly a major conurbation.

The book is entitled Conurbation; in it the area surveyed is called the Conurbation, almost always with a capital C. This use of the word as a proper noun is somewhat misleading. The subtitle is "A planning survey of Birmingham and the Black Country." There is a local patriotism which dislikes the name Black Country. But the need is, surely, not to confine the application of the disliked name but to remove all justification for it. On pages 100–103 there is a series of very good photographs under the general heading of "Through the carriage window: from Birmingham to Wolverhampton by rail." These, and

the relevant text, form a vivid exposure of the devastation resulting from the unplanned industrialization of the last century, and of the urgent need for a planned "tidying-up" and redevelopment. The "first Black Country town" does not seem noticeably blacker than Birmingham; though the city has made more progress than some of its smaller and poorer neighbours.

The survey work recorded falls into two main divisions. There is a study of the natural and the man-made surface features and their present use or misuse, and an economic survey of the industries. Then the results of these are used as bases for suggestions for redevelopment. These include some precise and fairly detailed plans of which those referring to derelict areas of industrial waste land, in Chapter 14, are full of interest and should be of value to anyone who has to consider the problem of making the best use of such areas anywhere.

The survey of Surface Utilization is described in Chapter 11. The work is recorded on 64 sheets of the six-inch Ordnance Survey map, illustrated here by facsimiles of two of those sheets (described on p. 159 as "Two facsimiles of the sixty-four . . . sheets"). The accuracy of this work can only be checked on the ground; but the previous work of the West Midland Group, and the internal evidence here, give ground for confidence in it. It is a work of incalculable value for the future of this conurbation and as an example of a necessary basis for planning. One direct result of this survey is the stimulus it gives to the perception and clear statement of particular ills, and so to the formulation of definite problems for the planners. If the first step towards a correct answer to any question is to state that question in precise terms, then such a survey is the first step towards a sound plan.

Two outstanding recommendations are of interest. The Group propose that no new industries be admitted to the area, and that immigration shall not be allowed. This is based on the conclusion that the present area is adequate, if it is well used, for the existing industries and the population dependent on them but leaves no room for any considerable increase. There are now areas of slums —both factory slums and residential slums—but these are balanced by areas of derelict and unused land. The relative areas and their location are such as to justify the conclusion. But how is it to be enforced? Large and prosperous urban areas do attract immigrants. This conurbation is large and even now relatively prosperous, and so attractive. If the suggested plans succeed it will become even more so. In a free society, movement into and out from it cannot be prevented; and if such migration could be stopped the stoppage would lead to a stagnation which would soon destroy the prosperity and, in the long run, the life of a community so cut off. Of course no such enforced stagnation is contemplated. But it would be interesting to know how to keep the population approximately constant over any considerable period without danger of producing this result.

A second proposal is a variant, and in the reviewer's opinion a great improvement, on the Green Belt: it is that the conurbation be developed so that all its industrial and residential areas shall be in a Green Setting. This is also expressed in another form by proposing that the several communities which exist, more or less distinctly, shall be planned in defined areas separated from each other by open spaces. This is worked out very convincingly in Chapter 13 (page 199 and on). The diagrams, Figures 39, 40 and 41, illustrate the present and the imagined future distributions of urban areas within the Green Setting.

In respect of the local government of the conurbation the whole of the Survey emphasizes its real and essential unity. This is recognized in the proposal (page 253) for a unified Planning Control. But, surely, that proposal is stultified by the preceding one for the division of the conurbation among "a limited

number of large All-Purpose Authorities of County Borough status." This would be to divide it among a number of equal and independent authorities, and trust them to cooperate willingly and harmoniously on all occasions. Is not the correct plan a federal system which would ensure common action where necessary and also leave the maximum of local freedom to its members? The study of the relations and the proper division of functions between such local authorities in a conurbation is an important part of town planning.

The format of this book and the quality of the diagrams and other illustrations is well up to the high standard we expect from the Architectural Press and the West Midland Group. But there are real defects in the production. The majority of the maps and map-diagrams are without scales; though it is usually possible to calculate the scale by comparison with other maps in the book or elsewhere. The figures are, of course, often referred to in the text, but in most cases without stating the page; for example, Figure 37 is first mentioned on page 81, but the reader is not told that it is on page 185. The photographs are not numbered, and any reference to them is in the form of "the middle photo in the second row on page —." Chapter 15, Summary and Conclusions, does include adequate cross-references; but they are conspicuously absent in most of the book. No editor is named; and it seems that editorial revision has been somewhat uneven.

This book enormously increases the debt which all students of the many problems which concern planners and citizens owe to the West Midland Group. It is a great contribution to our knowledge of the geography and economics of an industrial conurbation. C. B. F.

THE ENGLISHMAN'S HOLIDAY: a social history. By J. A. R. PIMLOTT. *London: Faber and Faber*, 1947. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 318 *pages; illustrations.* 16*s*

The institution of the annual holiday has brought a new industry into being and has led to the rise of many great towns. Mr. Pimlott points out that historians have paid scant attention to the development of this important feature of modern social life with its migration of holidaymakers to sea, countryside and mountains. He might have added that geographers have ignored the subject to an even greater degree than historians and that this neglect is characteristic of the general neglect of social geography as a whole. The author has admirably filled the gap in social history with a very readable account of the holiday from its early religious origins to the time when holidays with pay became part of the minimum living conditions of the workers. Mr. Pimlott says that he is telling "the story of how it has come about that the typical English family expects to go away for a holiday at least once a year, and why this takes the form it does" and adds more briefly "why 'summer holidays' and why Brighton and Blackpool?"

It is true to say that the annual holiday is largely English in origin. Its growth can be traced partly to the medical profession which increasingly recommended the healing qualities of mineral waters in the sixteenth and seventeenth centuries. Bath, known since Roman times for its health-giving springs, Buxton, Tunbridge Wells and Epsom all flourished as a result of the activities of the medical profession. At least one hundred mineral springs are believed to have been discovered in England in the second half of the seventeenth century. "One would think that the English were ducks; they are for ever waddling to the waters," wrote Horace Walpole in 1790. The movement to the springs was followed by the rush to the sea, also on medical grounds. The rapid growth of Brighton and other seaside towns was the result. The author gives a full account of the effects of the building of the railways on the fortunes of the resorts and pays special attention to the part played by excursion trains. He

concludes that the advances in third-class railway travel "were a major cause of the accelerated growth of the popular seaside resorts in the 'seventies and 'eighties."

The book describes not only the history of the Englishman's holiday in England but also the story of his trips abroad. A chapter is devoted to the Grand Tour in the eighteenth century and two further chapters deal with the development of the "playgrounds of Europe" for English tourists in the nineteenth century. The author has thus completed his picture, but he has not the space to treat this part of his subject very adequately. He gives an interesting account of Thomas Cook and discusses his claim to be one of the foremost civilizers of the English people.

The chapters on holidaymaking at the end of the nineteenth and during the twentieth centuries are perhaps the most useful for a geographer as they show how tourist traffic has become a great industry and its effect on the growth of English towns. The history of the movement for holidays with pay is given a separate chapter and the whole subject of holidays is brought down to the present day. Another example of the book's topical importance is its description of holiday camps; the author spent a few days at one of Butlin's holiday camps and gives an account of his personal experiences.

This lively and amusing book with its attractive plates and illustrations should entertain the general reader, and while it is primarily historical in outlook it will suggest many new lines of thought to social geographers. The work is in every way scholarly, but the apparatus of scholarship has been skilfully placed in the background. Footnotes have been reduced to a minimum and the invaluable bibliography has been placed in an appendix. The book closes with a list of suggestions for further research in allied topics, and it is to be hoped that some of these will be carried out by geographers. E. W. G.

LOCAL STUDIES: BISHOP AUCKLAND. Ministry of Education Pamphlet No. 10, prepared by the Central Office of Information. *London: H.M. Stationery Office*, 1948. $8\frac{1}{2} \times 6\frac{1}{2}$ *inches;* 95 *pages; maps, diagrams and illustrations.* 3*s* 6*d*

This pamphlet is the handbook to the Ministry's visual unit 'Local studies.' It takes Bishop Auckland as a type and comprises a series of studies capable of being undertaken by children in school. The object of the handbook is to give students in training to be teachers a basis for their discussions in local studies, and from this point of view it will be warmly welcomed although, of course, there is no pretence that it gives a model to be copied in other areas or even in Bishop Auckland itself. The study of the home area is an indispensable part of geography teaching, but it is not often well organized and recorded. Therefore this handbook will be welcomed in schools generally and its objective will be attained if it stimulates discussion and encourages teachers and pupils to select and carry out coordinated first-hand studies of their own neighbourhood.

It is interesting to notice that the Ministry expresses thanks to the Royal Geographical Society for its help in the making of the handbook. The Society is always anxious to assist teachers and the education authorities. L. B.

HEREFORDSHIRE. By H. L. V. FLETCHER. (The County Books series.) *London: Robert Hale*, 1948. 9×6 *inches;* x+243 *pages; map and illustrations.* 15*s*

This is one of the first of a new series of volumes on the counties of England. It is not intended as a guide book but gives a delightful picture of the county as a whole. It is written in a pleasantly intimate manner which makes easy reading

even for those who are not closely connected with the district. It is well illustrated with excellent photographs and is good value as a book of reference to local history as well as for reading for pleasure.

The author knows his Herefordshire intimately. The book is full of details and anecdotes from his personal experience. He devotes a chapter to each of the five principal towns, in which, as in his excursions into local legends, superstitions, nature study and geography in the later chapters, he is more concerned to give the atmosphere of the county than facts and figures. In this he succeeds. All who appreciate this most pastoral of English counties will enjoy this book which though scholarly is never dull. J. R.

ROMAN WAYS IN THE WEALD. By I. D. MARGARY. *London: Phoenix House*, 1948. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 287 pages; maps, diagrams and illustrations.* 25*s*

The Weald has often been regarded as a trackless and impenetrable country in Roman times. It doubtless did offer many difficulties to early settlement, but there is evidence that there was iron-working there even before the Romans came, and that they in turn developed the industry and built roads through the district. Some account of these ironworks and communications in the Weald was given by E. Straker and I. D. Margary in this *Journal* in 1938 (vol. 92, pp. 55–60). There is also much information scattered through other books and journals—a great deal of it the result of Mr. Margary's own investigations. "The need for a book to collate the information had become pressing," and the present volume is the result. It makes most fascinating reading.

The first four chapters constitute a general introduction and are concerned largely with methods of investigation. We are told, in effect, that the search for an unknown or partly known Roman road falls into two stages. In the first place there is the indoor work on maps and earlier literature; the accumulation of hints provided by finds, by "significant alignments of lanes, edges of woods and parish boundaries" and by air photographs. On these photographs "we may expect to see as crop marks light streaks over buried metalling, due to parching of grass or earlier ripening; or dark streaks over silted-up ditches, due to the ranker growth there; or perhaps streaks, light or dark, relative to the general colour of the vegetation, due to variations in the character of the herbage growing over the road or its ditches, especially on heaths." Shadows caused by irregularities are also very revealing. Following upon this background study comes fieldwork; the detailed examination for traces on the ground and the search for buried road surfaces by means of probing. "A worker accustomed to the 'feel' of his probe can distinguish between casual stones and a laid stone surface even where the latter is quite thin. . . . A buried road surface can thus be traced and in favourable circumstances even accurately outlined without any digging at all." Finally comes the excavation of complete sections "to fix the alignment definitely" and to show "the general nature of the road construction." There will, of course, be gaps where the road has vanished, and a faint ridge in one field may disappear in the next or give way to scattered traces of metalling.

The remaining eleven chapters each discuss the evidence for a road or group of roads: Stane Street, the London–Brighton way, the London–Lewes way and others. A feature of these discussions is a large number of map-strips on a scale of six inches to one mile. These show the detailed course of each road in relation to present-day topographical features; and explanatory notes are added on many of the maps. These route maps are supplemented by a wealth of diagrams, cross-sections and photographs. It is a model presentation that will form a pattern for similar work in other areas.

The roads that are thus discussed are of two kinds. In the first place there

are those which formed the main military network and which were constructed soon after the Roman conquest. And in the second place there are those constructed later in order to serve the needs of iron making; these latter also follow straight lines but have not the undeviating straightness of the military roads. There is also a third group of local roads and lanes, and Mr. Margary discusses the problem raised by these in relation to Roman land settlement and to "centuriation." It may be that some readers will not be able to follow him into these bypaths. But none will withhold his admiration for the main body of the book. Mr. O. G. S. Crawford, who contributes a foreword, says: "It is a record of the most important investigation of the Roman roads of England that has ever been undertaken, and it will become a classic." H. C. D.

LA CÔTE ATLANTIQUE DE LA LOIRE À LA GIRONDE. Tome 1, Les aspects naturels. Introduction à une étude de géographie humaine. Tome 2, L'homme et la mer. Étude de géographie humaine. By LOUIS PAPY. (Publications de l'université de Bordeaux, No. 4: 1, 2.) *Bordeaux: Éditions Delmas*, 1941. 10×6½ *inches;* vii+302 *and* 528 *pages; maps and illustrations*

M. Papy's work is a detailed study of the French Biscayan coast between the Loire and the Gironde, together with the off-lying islands. He calls this territory a "maritime fringe." For comprehensiveness of treatment this book can have few parallels in coastal studies. It will be of special interest to admirers of the classic French regional monographs, which have usually dealt with regions as more commonly understood. Students of methodology may with profit inquire whether a monograph on a coastline is a regional monograph at all in the strictest sense, and this book may well encourage a new trend in geographical studies. What is beyond question is that M. Papy has chosen a coastline which, in its physical make-up and human response, is marked by a diversity within unity and is clearly differentiated from neighbouring coastlines.

The first volume, "Les aspects naturels," comprises four long chapters covering the climate and offshore currents, the structure of the coastal strip, the work of the sea and winds in modelling the shoreline, and the biology of the seas. The chapter on climate and offshore waters introduces an interesting account of the long controversy over the existence and character of the "Gascony" current. The second chapter treats of the structure of the land behind the coast—a coast of primary rocks in the north where the Armorican Massif extends into the Vendée, and of secondary and tertiary beds in the south forming part of the Basin of Aquitaine. This coastal belt, generally reduced to low-lying surfaces by past erosion, is varied by the occurrence of the "Marais"—depressions, often synclinal, which have been filled with a marly clay of marine origin. The chapter ends with a detailed study of changes of sea-level since prehistoric times. "The work of the sea and winds" is a most interesting account of shoreline processes, such as cliffing and the development of abrasion platforms, dune formation and movement; the treatment of silting and the creation of mud-banks is very full.

The second volume is a study in the human geography of the coast. The chapters deal successively with the early development of the ports; the ports in the last hundred years; the characteristics of seaborne trade; the sea fishery; the two maritime cities (Rochefort and La Rochelle) and social types among the coastal and insular population; the rise and decline of the sea-salt industry; the "élevages marins," especially such activities as oyster culture and mussel gathering; the creation of polders; the social and economic organization of coast dwellers; and seaside resorts. Each chapter is a carefully documented study. The author throws many interesting sidelights on the utilization of local

resources and opportunities; for example, in two pages there is an admirably clear account of the traffic of La Pallice, the modern outport of La Rochelle, and the peculiar nature of its hinterland. The accounts of the draining of the "Marais" contain many illuminating references to economic and social factors which affected this transformation of the environment.

Here and there, perhaps, the question arises as to whether all the detail is justified. The account of the fisheries for example contains some descriptions of fishing techniques which are of little interest to most geographers. The wealth of illustration however will be generally admired, for it is backed by constant topographical and geographical reference and by a pervading historical sense. F. W. M.

LA BRETAGNE CENTRALE: étude géographique. By MARCEL GAUTIER. *Roche-sur-Yon: Henri Potier*, 1947. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* iv+453 *pages; sketch-maps, diagrams and illustrations.* 25*s*

This is a minutely detailed account of a small area of France. The author begins by complaining that our knowledge of Bretonne geography has suffered from over-simplification and then goes on to analyse the physical characteristics of the area defined by him. He points out that the relief corresponds to the structure on the whole, but that a geological history full of incident, including two marine transgressions, has resulted in the main features being two erosional plateaus derived from a former peneplain and having a surface broken by rocky ridges. Further discussion of detail brings evidence of climatic change and of a discordance between the structure and the drainage system, resulting in one place in antecedent and in another in superimposed river meshes. The description of the climate is necessarily thin, since wider influences overcome local factors; but the author raises interest at this point by inserting a selection of peasant weather lore in Breton dialect. This collection of doggerel leads on to the purely human portion of the book, in which the history of the area, beginning with the legendary Broceliande and fully supported by a study of place-names and their significance, is related to local geography. The author firmly states his dislike of *la superstition des données numériques*, and proceeds to describe the gradual spread of population from the perimeter and the bringing of the previously forested land under the plough. At one time local iron and linen industries flourished, but have been more or less killed by overwhelming competition from without. In consequence of this, of the relative poverty of the soil and of the out-of-the-way position of the area, the standard of housing and cleanliness is low. Wooden clogs continue to be the ordinary footwear because of the muddiness of the roads and paths, especially around the dwellings. In other ways too the area has its peculiarities: the form of house and village and the field system. In a country of farms there are necessarily no large towns, nothing larger than the *bourg*. Agriculture naturally demands a good proportion of the book. The writer sums it up by saying that *la vie des campagnes reste ici pétrie d'archaïsmes avec un levain de nouveautés*. Nevertheless, there are prospects of improvement owing to better equipment and transport and more coordination of effort. The introduction of farm machinery has already begun to raise the standard of life.

The work is illustrated with 23 photographs and more than 100 maps and diagrams. Most of the latter are poorly executed and worse printed, which spoils an otherwise pleasingly produced work. The text itself is a model for exhaustive study of local geography. In spite of the minuteness of detail described, it keeps that lightness of touch and human interest which distinguishes French geographical writings. E. D. L.

Ἡ ΧΙΟΣ ΠΑΡΑ ΤΟΙΣ ΓΕΩΓΡΑΦΟΙΣ ΚΑΙ ΠΕΡΙΗΓΗΤΑΙΣ (Chios according to the Geographers and Travellers). Edited by P. P. ARGENTI and S. P. KYRIAKIDIS. *Athens: Estia Press*, 1946. 3 *vols.*, 12½×9½ *inches;* xvi+1944 *pages. Portfolio of* 78 *plates*

Mr. Argenti's works on the history of his native island of Chios are well known. He has now turned to its geographers. In conjunction with Professor Kyriakidis, he has edited the accounts of the island, many of them unpublished, given by geographers and travellers from the eighth century to the end of the nineteenth. These are printed in their original language (Arabic authors in French translation) with a modern Greek translation. The work aims at completeness, at gathering together all references to Chios however slight, and there is inevitably much repetition of matter; but this is in itself interesting as it provides evidence of the manner of composition and degree of original observation of the early topographers.

The earliest traveller recorded is an Englishman, St. Willibald of Waltham Abbey, who visited Chios in 723 on his way to the Holy Land, and Englishmen —merchants and scholars—bulk large in the sources. Many of our countrymen too have resided in Chios, among them that "Englishman of the name of Baimbridge" or Bracebridge whom John Galt commemorates, "who had searched all Europe for a healthy place in which to end his days . . . and lived in Scio until he was ninety-three." The beauty of the island, "the Paradise of modern Greece," with its many gardens and its charming and friendly inhabitants (especially female) made it a favourite resort of the romantics. But most of the travellers were drawn there by trade, and Chios has a large part in the history of the Levant trade owing to its monopoly of the gum mastic. Among those who speak of the mastic trade is Christopher Columbus, who went thither in 1474, or 1475 in all probability, to load a cargo of mastic.

The plates should be of especial interest to cartographers, as successive stages in the representation of the island and of its chief town and port can be followed from 1420 until the early nineteenth century. Many of the maps are reproduced in colour. There are also views of Chios and plates of the costume from the seventeenth century to the present day, many of them in colour.

This is a finely produced book with a handsome printed page and the quality of the printer's work is very high. The texts are printed in ten European languages, many of them according to old-fashioned orthography, and misprints are few. Owing to its size and cost it will be a rare book in England. Copies are available in London at the British Museum and in the Library of the Hellenic Society. T. J. D.

POLAND OLD AND NEW. By W. J. ROSE. *London: G. Bell*, 1948. 9×6 *inches;* xii+354 *pages; map and illustrations.* 26*s*

What Professor Rose writes about Poland is always worth reading, for there are few scholars in this country who know as much as he does of the Polish Republic and its people. 'Poland old and new' is a straightforward handbook with chapters on most aspects of Polish life and history. The historical section is the most attractive, written with the sureness and sense of proportion of an expert. The epilogue, describing the author's journey through Poland in the early spring of 1947, is deeply interesting and not a little moving.

From the point of view of the geographer, the first chapter on "Country and people" is the least satisfactory. It should be clear by now that if books of this type are to contain a topographical description, it needs professional handling no less than the historical and economic sections. It is a pity that an authoritative work like this—and one could cite others—should have a rather amateur

geographical introduction. The geography of Poland has a unique and vital importance in the history of the country, and its presentation in a handbook of this kind demands considerable experience and skill in geographical writing. The map of the "New Poland" at the end of the book is interesting but hardly adequate for the needs of the letterpress. The photographic illustrations are delightful: good and informative pictures pleasantly reproduced.

In a handbook of Poland produced in England in 1948, the suggestion of strain for the author is perhaps inevitable. A scholar deeply and personally interested in the fortunes of a group like the Poles tends to write an apologia. There is no mention for example of their questionable pounce in 1938 on the disputed territory of Teschen during the disintegration of the first Czechoslovak Republic. An almost blind eye is turned to the shadows creeping across the Polish Republic from the east after the second world war, and to the final emergence of a police state. It has been sorrowful for those who watched the resurrection of the Western Slavs after the first war and their desperate struggles for freedom and prosperity as these are known to Western Europe to see their collapse, their terrible captivity and their emergence in a strange and repellent political form. It is only natural to hunt for the most congenial scraps in the political and economic life of the country and for explanations of what is grievous. But there is urgent need for good books on the part of Europe which is at present behind the Iron Curtain, and in spite of these limitations Professor Rose's work will certainly help to meet it. H. G. S.

EUROPE'S POPULATION IN THE INTERWAR YEARS. By DUDLEY KIRK. (Economic and Financial Publications of the League of Nations.) *Princeton: University Press*, 1946. $10\frac{1}{2} \times 8$ *inches;* xii+303 *pages; maps.* 17*s* 6*d*

Population studies of large areas are still rare. For this reason alone we could warmly welcome the appearance of Professor Kirk's study, which is a résumé of conditions in Europe as a whole and summarizes a mass of material from 27 states and in 25 different languages—a task never before attempted in such detail and one that could only be handled by a large and well-equipped research team like that of the Office of Population Research. It begins with a survey of population distribution by geographical regions and by countries. The urban-rural balance is examined, then changes in distribution, movement of population, and migration both within and outside Europe.

The special attraction of Professor Kirk's review is that his approach is more strictly geographical than is usual in population studies. The emphasis on the relation between a people and its geographical background is strongly maintained; and on these grounds the book will have much interest for those geographers who need an expert presentation of demographic factors but are a little daunted by the weight of advanced mathematics and statistical analysis that so often accompany population research. Another valuable feature is a discussion of the social and economic background in Europe, and also of ethnic diversity; at last a student of European affairs has suggested a clear basis of distinction between "race," "people" and "nation."

Besides the data presented in the text, there are a review of source-material and a discussion of the validity of census reports. These not only provide a guide for the growing number of geographers who are pursuing demographic problems, but serve also to draw attention to certain deficiencies of the British census as compared with those of other countries. From many points of view, then, 'Europe's population in the interwar years' can be recommended as a first-rate reference book, which one might regard as indispensable to a student of European affairs. Numerous well-drawn maps and diagrams add considerably to its usefulness. W. B. F.

ASIA

INTRODUCING CHINA. By GEORGE YEH and C. P. FITZGERALD. *London: Isaac Pitman*, 1948. 7½×5 *inches;* xvi+116 *pages; maps and illustrations.* 6*s*

As a brief introduction, and within its severe limitations of space, this little handbook has some good features. The chapters on the family, on art and literature, on industry and agriculture, are admirable, though the important question as to how rice-culture can be adapted to take advantage of modern science and powers is not raised. Until this problem is solved a high proportion of the population will be kept at a low standard of living. The account of Confucianism is good, but that of Taoism, as usual, is inadequate. Some mention should have been made of "yang" and "yin," the principle of Harmony, and the part played by the unseen spirits. Nor is Taoism quite such an impracticable philosophy as those who do not understand it seem to suppose.

The historical sections, brief as they necessarily are, are the least satisfying, and it is doubtful if they will inspire readers to seek out fuller sources. It is misleading to speak of "feudalism," which means essentially holding land in return for military service, as ever having really existed in China. The feudal conceptions accorded a high social status to the soldier, as in Japan. In China it was traditionally low. It is not fair to stigmatize Yuan Shih-kai as a traitor and leave it at that. He was against a Republic, but that is not the same thing.

In discussing the language problem, too much space is given to the "disadvantages" of an alphabetical script. But the bond of unity of the written ideographic one is flimsy when so few can read it beyond a few common characters. And what about the typewriter in the modern world! Some consideration might have been given to the suggestion of including the determinative element in the ideogram in an alphabetical transcription. But the problem does seem insoluble.

In conclusion, the reviewer of a book of this type is impelled by current happenings to observe that what the reader of to-day wants to know about China is, bluntly, "What is wrong with her?" The authors of this little survey but dimly indicate some of the answers. May it be that Confucius was injudicious in rejecting the doctrine of "original sin"? A. S. E.-S.

LABOR PROBLEMS IN SOUTHEAST ASIA. By VIRGINIA THOMPSON. (Published under the auspices of the International Secretariat, Institute of Pacific Relations.) *New Haven, Conn.: Yale University Press* (*London: Geoffrey Cumberlege, Oxford University Press*), 1947. 9×6 *inches;* xviii+283 *pages.* $4.00 *or* 22*s*

The student of South-east Asian affairs will find a great deal of useful and hitherto unobtainable information in this new book by Miss Virginia Thompson. After a brief introductory section on the labour question in the area as a whole, the author describes at some length the problems as they appear in each of the component states, Burma, Malaya, Indonesia, Indochina and Siam. The treatment in each case conforms to approximately the same pattern, and while the geographer may regard the sections on labour organization and working conditions as lying strictly outside his province, the pages dealing with agricultural conditions, handicraft and factory industries, and immigrant labour must concern him very closely. One could wish however for a higher degree of cohesion between the chapters on the several countries, and in particular for more broad comparisons between the aims and achievements of the colonial powers hitherto concerned in the economic development of the region. It

would be interesting also, in view of the frequent strictures passed on European administrators, to know why the author has excluded the Philippines from her study; since it now seems to be the accepted practice of the Institute of Pacific Relations, as of most other bodies engaged in Far Eastern research, to regard these islands as forming part of South-east Asia.

The books ends with a short supplement on the immediate post-war situation which records the author's personal observations during a journey undertaken "between December 1946 and June 1947 to some of the principal cities of Southeast Asia." As is inevitable in present circumstances, this has already dated rather badly, but fortunately it appears that Miss Thompson, with characteristic zeal, is already at work on a further volume dealing more fully with the consequences of the Japanese occupation of South-east Asia, and later information will no doubt be presented therein. C. A. F.

THE TRAVELS OF THE ABBÉ CARRÉ IN INDIA AND THE NEAR EAST, 1672 to 1674. Translated by Lady Fawcett. Edited by Sir Charles Fawcett with the assistance of Sir Richard Burn. (Hakluyt Soc., 2nd ser., vols. 95–7.) *London: Bernard Quaritch (for the Hakluyt Society)*, 1947 3 *vols.*, 9×5½ *inches;* lvii+xxiv+xxiv+984 *pages. Vols.* 95–6, 37*s* 6*d each; vol.* 97, 31*s* 6*d*

A very valuable addition to the history of India in the late seventeenth century is made by these three volumes of the Abbé Carré's journal. The manuscript had been lying, not unknown but unexploited, in the India Office library for more than a century; and nobody had taken much trouble to find out anything about the author.

Barthélemy Carré de Chambon was born about 1640, took holy orders and while still a young man was employed by Colbert, the famous minister of Louis XIV, as an envoy to the East. The mission which he records in these volumes was ostensibly to carry despatches to General Blanquet de la Haye who was in command of a squadron sent to Indian waters to support the recently started French trade in India and possibly to drive the Dutch from Ceylon. He was not exactly a King's Messenger in the accepted sense of that term because it was evidently his business to see what the French East India Company was doing and to report to Colbert on its affairs; and the circumstances of the time, when France and England were allied against Holland, and the French had captured the fort of St. Thomé south of Madras, led to his being unexpectedly employed in Madras on behalf of his fellow countrymen who were besieged in St. Thomé. He had therefore plenty of material for his journal. This was not the first expedition he had undertaken and he seems justified in claiming that he passed a great part of his life in travelling. He had, for instance, accompanied Caron, the director general of the French East India Company, to Madagascar and India; and if, as is surmised, any report of those travels in 1666–1671 survives in the Bibliothèque Nationale it should be well worth publishing.

Carré devotes a great part of his narrative to describing his journey in either direction; the route and the timing of the various stages are given in detail. The early part of his outward journey was by no means easy. He left Paris on 28 March 1672 for Lyons, and after an uncomfortable journey reached Leghorn on April 17. At that port he got a passage on an English ship to Alexandretta; the voyage lasted over a month. His ride to Aleppo was comparatively uneventful. Troubles began in earnest when he decided not to join a caravan travelling to Baghdad but to ride across the desert dressed as an Arab, well armed and accompanied by an Arab guide. On the way he was robbed of almost everything

except his papers and letters; he had a treacherous guide and "was on the point of breaking his head with a pistol-shot"; and he had to spend a night in a tree to escape from four or five lions which "prowled round the place where we were, roaring in a terrifying manner." As he could not sleep in his tree he spent the time in serious reflections and moralizing. Pious reflections recur in the book but are never so insistent as to spoil the well-told story. It is indeed the experienced traveller rather than the cleric with whom one is usually confronted.

Refitting in Baghdad with the help of Capuchin Fathers and of a Christian Arab, he went on by boat to Basra. Progress from there was difficult and the Abbé showed his mettle by taking the tiller and steering by the Pole Star when his small ship, which he calls a "taranquaine," was clear of the river. From Kung he went on a Portuguese vessel to Diu and, after many delays and changes, arrived at Surat on November 2, nearly seven months after he had left Marseilles. Most of his journey from Surat to Goa was accomplished by land and involved some hard going on the edge of the Western Ghats. From Goa he went to Bijapur where he was so ill with malaria that he was thought to be dead; and so to Golconda and on to St. Thomé. On the return journey he was allowed to sail from Madras on an English ship, one of seven which owing to the war with Holland were making the homeward voyage *via* the Malabar coast and Surat instead of direct to England. He landed at Bombay and went overland to Surat. There he could have got a passage home on a French ship, but in spite of previous experiences he preferred the route by the Persian Gulf and the desert—and once again he fell into the hands of an Arab bandit. The latter part of the journey was full of exciting incidents including a stop at Messina where there had been a revolution, of which a one-sided but very interesting account is given.

After the fashion of his time the Abbé was prolix, but it is seldom that he lets his pen get the better of him. Sir Charles Fawcett in his introduction writes that the journal shows Carré "not only to have discharged his mission from Colbert with a zeal and thoroughness that deserved well of his King and country, but also to have been an astute, upright and kindly man, an entertaining raconteur, a courageous critic even of his own countrymen, and an enterprising and observant traveller." That is a very just appreciation. He could describe the incidents of travel well and he was equally happy in his comments on affairs. His comparisons of French and English methods were pointed and can hardly have been welcome in Paris. He had a poor opinion of the Portuguese and could hardly find words for his disgust of what he saw in Goa—"this grand town, once so rich and called the Treasury and Queen of the East, is now at its last gasp."

It is characteristic of Carré that he got on well with most of the men and women (he had a good eye for the latter) with whom he came in contact. He had friends in most places, one of them being Gerald Aungier, a celebrated governor of Bombay. Speaking of European companies in India, Aungier showed him "the cause of their profits and losses." In the cool of the afternoon in Bombay Aungier ordered out his palanquin, two carriages and several fine Persian horses and invited all his suite, including Carré, for a promenade. He showed the visitor the lay-out of the new town which "will, no doubt, be one of the sights of the country, as it has a harbour which can hold a great number of ships." Of Sir William Langhorn, the governor of Madras, Carré speaks less favourably; but Langhorn was in an awkward position. The French in St. Thomé were besieged by the troops of the King of Golconda in whose territory that place lay. It was from Golconda that the English held Madras. If then

Langhorn openly helped the French with supplies he would offend Golconda; if he remained neutral he offended his allies the French. That and other historical points are admirably explained by the editor.

The manuscript has been translated by Lady Fawcett with obvious sympathy for and understanding of the French idiom, and edited by Sir Charles Fawcett with the help of the late Sir Richard Burn whose writings on the history of India are well known. The editing of these three volumes is a fine piece of scholarly work. S. T. S.

YANKEE SURVEYORS IN THE SHOGUN'S SEAS: records of the United States Surveying Expedition to the North Pacific Ocean, 1853–1856. Edited by ALLAN B. COLE. *Princeton: University Press (London: Oxford University Press)*, 1947. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 161 *pages; map and illustrations.* 14*s*

This is an account of the important American surveying expedition to the North Pacific which followed the Perry Treaty of 1854, and was designed partly to test Japanese intentions and partly to assist the development of American seaborne commerce with the East. It is mainly related by extracts from the official correspondence of Lieutenant John Rodgers, who succeeded to the command of the expedition in 1854. During its course, a great deal of work was carried out in the area extending from Formosa to Bering Strait and Herald Island. It is perhaps not generally realized how much hydrographical survey still remained to be done in that area; it had not been definitely established for example whether Sakhalin was an island or a peninsula. The main purpose in publishing this record however is to illustrate the circumstances surrounding the initiation of Japanese–American relations. Rodgers constantly encountered Japanese obstructiveness, which he met with firmness and without serious conflict. Like many of his compatriots however he believed that the Japanese had accepted the Treaty unwillingly, and that force would be necessary to secure full compliance. This led him to pass such comments as "Words without the authority of many cannon will avail little." G. R. C.

THE JUNGLE IS NEUTRAL. By F. SPENCER CHAPMAN. *London: Chatto and Windus*, 1949. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xiv+436 *pages; maps and illustrations.* 18*s*

The astonishing exploits of the stay-behind parties in Malaya during the Japanese occupation of 1942–45 are already familiar, at least in outline, to readers of the *Geographical Journal* (110 (1947) 17–37) from a recently published lecture to the Society given by Colonel Spencer Chapman himself. This book tells his story in considerably greater detail and is well illustrated with a number of excellent photographs. To anyone with first-hand experience of either the Malayan jungle or of conditions under Japanese occupation the resourcefulness, courage and endurance displayed by Colonel Chapman and his associates will be apparent on every page of this account. One's only disappointment arises from the fact that it is pure narrative from start to finish and makes no real attempt to reveal the deeper impress of these unique experiences on the men concerned. C. A. F.

AFRICA

IBO VILLAGE AFFAIRS. By M. M. GREEN. *London: Sidgwick and Jackson*, 1948. $7\frac{1}{2} \times 5$ *inches;* xi+262 *pages; map and diagrams.* 10*s* 6*d*

This unpretentious but valuable study complements Dr. C. K. Meek's 'Law and authority in a Nigerian tribe', published in 1937. By his terms of reference

Dr. Meek was restricted to survey work, and though his study is first-class it lacks the illumination that comes from direct observation of "modes of regulating conduct which, at most, have only a quasi-legal character" (Meek, *op. cit.*, p. xv). This is essential even in a society with instituted courts; without it an analysis of the problem in a "stateless" society such as the Ibo is tremendously difficult. Miss Green, a Leverhulme Research Fellow, spent six months of each of two tours in one village, and could thus record data for an analysis of the law in maintenance, in the breach, and in making.

Miss Green begins her book with a fair account of local and kinship organization before passing to the problems of Ibo law. She then returns to describe social organization in two chapters on the implications of exogamy and three on women's organizations. She shows that marriages outside the exogamous villages or village-groupings link these autonomous units in a network of ties, which appears in two types of women's groupings: that of wives married into a village, and that of women of a village married elsewhere. The two analyses of organization might have been better treated together. Here, as in her chapters on law, Miss Green appears to me to be handicapped by lack of an adequate theory of social relationships. As she works generally with a teleological "functional" thesis, she often stops her analysis at points where I think she could enter on most significant problems. An example of this type of interpretation is where she suggests that *osu* slaves may often be defective people and the sexual taboo on them "an unconscious social device for segregating the less healthy strains in the population." This criticism is advanced from a specific point of view. All round, the book is to be commended for its vivid, interesting and suggestive presentation of the control of social life in an unorganized people who are one of the most important groups in Africa. M. G.

LA BATAILLE DU RAIL. By RENÉ J. CORNET. *Brussels: Louis Cuypers*, 1947. 9×5½ *inches;* 398 *pages; maps and illustrations.* 180 *fr*

"Colonizer, c'est transporter" was the policy of Leopold II of Belgium, and here is a vivid account of that policy in operation. Just fifty years ago the first railway was built in Central Africa, and by joining Matadi to Stanley Pool it provided an outlet for the Congo, so making possible the economic development of one of the richer tropical regions of the world. The construction of this railway must be ranked as a great engineering feat.

By his travels in the Congo between 1874 and 1877 Stanley had made known to the world the potentialities of this area, potentialities which would remain undeveloped until the lower and middle Congo could be joined by rail. His belief in the necessity for this line was not accepted in Britain, but in Belgium it led to the vivid interest in the project of King Leopold II, to the formation of the Comité d'Études du Haut Congo and to rapid surveys in 1884–86. Negotiations were entered into with a Manchester syndicate in 1885, but a national campaign against this led to the substitution of a Belgian company in 1887. Technical and commercial surveys were made in 1887–89.

From the beginning of Belgian interest in the railway the leading personality was Thys. The railway is his memorial and was built under his vigorous direction across ravines, gorges and country presenting appalling difficulties. After the preliminary surveys, 25 million francs were raised, 71 per cent. from Belgian sources, 20 per cent. from British, 8 per cent. from German, and 1 per cent. from American. Construction began in 1889. First the port of Matadi had to be hewn out of the sheer cliff, and over this same cliff the railway had to climb, then across the Leopold ravine, over the M'Pozo river and through the grim Palaballa massif. To the formidable difficulties of nature were added

those of labour, food, housing, health and criticism at home and abroad, the latter caused by the inevitably high mortality at first among the labourers. At last in March 1898 the great work was finished and one of Africa's fundamental transport links was opened; 243 miles long, it had 99 bridges and 1,250 viaducts. Although the mortality rate had greatly diminished in later years, 132 Europeans had died in its service and over 1800 others. As the author points out, all great enterprises have, unfortunately, been costly in human lives, the St. Gotthard Tunnel having claimed 450 victims and the Forth Bridge 56.

This great enterprise made possible the opening up of the interior, the use of steamers on the middle and upper Congo and the building of some 3000 miles of other railways. The experience gained served Belgian engineers in building railways in many countries. The greatness of the enterprise was suitably celebrated by the consumption, during the three-week voyage of the official party going out to the opening ceremony, of 4000 bottles of St. Emilion 1892, 1200 bottles of Château Roques 1887, several thousand bottles of other red wine, 2500 of white, 3000 of champagne, 1000 of 1847 and 1865 Port, over a thousand bottles of apéritifs and liqueurs and many thousand bottles of beer and mineral water. The original line inevitably had steep gradients, sharp curves and a low capacity, since money could never have been obtained in the first place for a more elaborate line. It was realigned between 1923 and 1931; the line passed to ownership by the colony in 1936, and in 1943 it carried over 800,000 tons.

Such is the fascinating story of a vital colonial railway. The author has carried out his task with distinction; his style is light yet well documented and is a refreshing change from the usually rather dull accounts of such enterprises. There are many excellent illustrations, a fine bibliography and good chronological summaries. It is perhaps unkind to mention faults in a notable book, but it should have included a good map of the whole line on a larger scale than those given; there is little account of the modern history and economic importance of the railway, and the pagination is faulty between pages 288 and 305.

R. J. H. C.

BRITISH MILITARY ADMINISTRATION OF OCCUPIED TERRITORIES IN AFRICA, 1941–1947. By Lord RENNELL OF RODD. *London: H.M. Stationery Office*, 1948. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii+637 *pages; maps.* 17*s* 6*d*

When, on 6 December 1940, General Wavell telegraphed to the War Office asking immediate attention for the question of administration in Italian Africa after occupation, he displayed a marked degree of faith and foresight. For at that moment Italian forces were in possession of Sidi Barrani, Kassala and Berbera. Yet within five months the Italian Empire in Africa had collapsed. Before February 1941 was out the nucleus of an organization had been created in Cairo under Sir Philip Mitchell as Chief Political Officer with Lord Rennell, later his successor, as Financial Adviser.

Events moved at breathless speed. Addis Ababa was occupied in April, eight months before the main operations against Ethiopia were due to begin, and the Political Branch was at once confronted with juridical, administrative and financial situations of great complexity quite unprovided for by the Manual of Military Law. There were no accessible records relating to the enemy administrations set up and operated during and after the 1914–18 war: the official history of operations in German East Africa, of which a first volume appeared in 1941, is incomplete to this day. Lord Rennell, who comments feelingly on this lack of guidance, has determined that it shall not be repeated; hence the present volume. It is not classified as an official history, but it is difficult to believe that any more authoritative or comprehensive account of how the

various territories in Africa were governed following their conquest during the last war will ever be published within the compass of one volume.

The Political Branch had many unique features. It was an exclusively military organization deriving authority direct from the commander-in-chief. It was not, once a territory ceased to be an operation area, subordinated to any area commander and its finances were from the outset separated from those of the military machine. Its adaptability and the astounding range of its activities are the best tribute to the wisdom of a policy which gave it so large a freedom from control and thus allowed common sense and goodwill to conquer seemingly intractable anomalies.

There was great diversity among the areas which had one after another to be taken in hand; and to the mainland territories were later added Madagascar and the Dodecanese. Eritrea, Italian Somaliland (Somalia), Cyrenaica and Tripolitania were all former Italian territory; but whereas in Eritrea there was a considerable settlement of Italians, in Cyrenaica upon its final reoccupation at the end of 1942 there remained none but friendly tribesmen who regarded the rehabilitation of the Italian legal system, as required by the Hague Rules, as a poor joke. In Ethiopia the task was to restore the Emperor's government where the whole framework of administration had been Italianized. The reinstatement of the Emperor called for great delicacy of timing lest there should be an interim breakdown of all authority. In British Somaliland it was not possible at once to re-erect the completely obliterated Colonial Office regime. Madagascar was technically friendly territory, but a Free French government could not at once be introduced and the occupation was opposed by Vichy forces. In the Dodecanese the Italians had already laid down their arms, but there remained hostile German garrisons, while the predominantly Greek population regarded itself as an ally.

Equally diverse were the functions to be performed. Judicial systems adapted to the juridical status of each territory had to be established, and civil police forces trained. The direct rationing of a civil population imposes impossible burdens on the occupying power. Self-support must be fostered, for the alternatives to re-establishment of economic life are unemployment and distress with passive resistance or underground movements. But the normal processes of trade and supply require the flexible regulation of currency exchange and banking. The Finance Section became the principal currency authority of the Middle East controlling reserves and exchange rates and dealing in a dozen currencies—lire of several descriptions and various pounds, dollars, rupees, francs, shillings and drachmae. Millions of pounds worth were handled almost without rules or precedents, but the essential decisions were so sound that at no time did the Administration find itself saddled with large quantities of valueless currency. A remarkable result of public confidence and reasonable exchange rates was a quite unexpected readiness among the African population to accept notes in place of bulky "hard" silver currencies—dollars and rupees.

The custody of enemy property represented an experiment of great interest; for a custodian might be called on to act as public trustee, administrator of properties and commercial manager for the Administration. The "parastatal" concerns, a peculiar Italian device, posed special problems, and at times custodians found themselves controlling hotels, cinemas, salt and mineral water monopolies and even an establishment for making artificial limbs. Trading with the Enemy Regulations, and requisitioning, for a time provided a further range of problems, while the repatriation of nearly 30,000 Italian civilians, mostly women and children, required a special staff whose care and

humanity earned the gratitude of the Italian government which sent ships round Africa to the Red Sea to collect them.

As a guide to the administration of occupied territories in circumstances contemplated by no textbook of international law, this is a work of exceptional importance and it is to be hoped that it will be studied by every member of U.N.O. who claims to be concerned for the well-being of the former Italian colonies. There is a useful chronology and the texts of a number of fundamental documents are given. But its austere title gives no indication of the absorbing interest of the narrative, which is packed with exciting episodes and romantic incidents. There may be instanced the discovery in Addis Ababa of the shipping documents of British-owned cargoes of enemy ships which had taken refuge in Massawa and their eventual meeting with the counterpart bills of lading in London; the minting from the original dies and distribution of £3 million worth of silver Maria Theresa dollars of traditional 833 fineness weighing in all nearly 1000 tons; and the spontaneous revival of the age-old dhow traffic of the Red Sea and Indian Ocean to the great advantage of the supply situation. H. B. T.

THE SORCERER'S APPRENTICE: a journey through East Africa. By ELSPETH HUXLEY. *London: Chatto and Windus*, 1948. 9×6 *inches;* xviii+366 *pages; map and illustrations.* 18*s*

This is in many ways a brilliant book, written with skill and with excellent observation of the fore and middle ground. Mrs. Huxley has the great gift of ability to convey to experienced and inexperienced alike extremely vivid impressions of East Africa, its problems and setting in terms at which the former cannot cavil and in which the latter detect the ring of accuracy. Her terse, vigorous style admirably suits the plan of the book, which is to string together "snapshot" impressions of a long journey through Kenya, Tanganyika, Zanzibar and Uganda on a thread of narrative and interpretation.

Perhaps the photographic metaphor is not unfair. Depth and speed are not easily combined in the one picture. Yet to anyone who has also wandered over East Africa, and realizes the difficulty of the task which Mrs. Huxley set herself, the achievement is remarkable for the clarity, depth and range of focus. To read this book in a London winter is to be transported in a flash to the "highlands' crispness, the firmness of landscape, the sense of space and freedom," "the hectic boom-town vitality" of Nairobi, Zanzibar's "narrow dirty streets with their little shops crammed together like fish in a net," the treeless altitudes of south-west Uganda and the dry immensity of the Wagogo steppe. The author is at her best in response to the stimulus of a landscape, natural and human, which is crowded with colour, form and variety.

In this book there is a mass of fact, crammed at times a bit helter-skelter, about some three-score "snapshots" compactly set out, very fairly stated in spite of strong opinion, and invariably interesting. There is something for everybody. We are given potted versions of the evidence on the Gedi ruins, a summary of the political system of Buganda, an account of the early difficulties of the groundnuts enterprise, material on the intricacies of cotton development in lacustrine Tanganyika, the familiar conundrums of soil erosion and of cattle and farming in mutual ruination, stories of the mounting cares of administrative officers, a hundred little conflicts of racial, personal and cultural cross-purposes. And so on through 366 tight-packed pages. There are charming and revealing conversational interludes, reflective observations and passing judgments. What more could be asked?

But there is something missing which, from such an author, should be there

and something there which, from such an author, should not be. What is missing is a depth of recent historical perspective. This is strange, for Mrs. Huxley has a sense of history. What is present is a shadowy figure in the background: not Lucrates the sorcerer's apprentice, from whom the book takes its captivating title, but none other than Pancrates the sorcerer himself. He is there, not this time as sorcerer but as philosopher. But what philosophy? Is it one of the varieties of seduced optimism, enlarging upon a loss of virtue until it becomes cosmic downfall? Or one of puzzled rhetoric?

Mrs. Huxley ends her book with certain questions. Let us look at them. Are we "attempting the impossible" in the colonies? Can we change "in the wink of an eye" natures moulded over centuries by their environment? Can one race pass on to another its experience? Can a halt be called to the "disintegrating pull of racialism"? In a world where "the last surplus" is that of goodwill, can suspicion be stilled or interests blended? Can you create "unity out of discordance ever, save by the slow fusion of history"? Must our colonial experiment ("a policy of sublimation, not of common sense," with "the aims of the idealist" but "the methods of the materialist") then outwardly fail? And, since there seems to be danger of drowning, where shall we "look for Pancrates" to turn off the water from the sawn broom? Yet did we not do right, for was not Africa when we found it "an impasse of sterile adjustment where change was called for, disruption necessary"? Well, there they are. The standards of interpretation are not notably clear. In a sense, these are all *magical* questions, prompted by Pancrates and answered by Pancrates as part of a device to get a new apprentice. Of all people, the author knows there is no magic to turn to, yet she hankers after it like Lucrates. It is a repetitive phenomenon of history.

One of the best ways to throw the future to the winds is to allow a tradition and a purpose, which seem good to all the tests of moderate realism as well as to those of moderate idealism, to disintegrate into doubt and fancy. Mrs. Huxley believes there is "an incubus on the back of our souls." If there is, someone put it there only very recently, someone who probably had been reading Sartre or Jaspers. Have we yet any real reason to suppose that those who come after the present in the colonies will not thank their stars as, with reason, we do in relation to the past, that some slow-burning genius of British procedure kept alight the fundamentals of a long tradition in spite of defects, eccentricities and possibly "failure" in particulars? Those fundamentals are the rule of law, incorruptible justice, moderation in executive action, insistent pressure towards liberation of the individual from arbitrary authority, a fair compound of right with duty. All these, as Mrs. Huxley says, are to be seen in East Africa. They are the rocks around which the tides of ideas run. A lot of people still believe they are safe to keep on building on. Why deliberately wade out to sea? W. E. H. S.

NORTH AMERICA

POPULATION ANALYSIS. By T. Lynn Smith. *New York and London: McGraw-Hill*, 1948. 9×6 *inches;* xiii+421 *pages; maps and diagrams.* 27*s*

This is really a textbook for the beginner in population studies with extensive references to conditions in the U.S.A. and, to a less extent, in other countries. Such topics as age composition, sex-ratio and economic status are first dealt with, then birth and death rates, fertility and migration. In each section, the author's method is to give attention to the basic principles involved, with some discussion of world trends in general, and then to devote the remainder to specific conditions in the United States. As a result, the book is a valuable

summary of the demography of the U.S.A. Maps of the distribution of religious sects, of the nationality of immigrants, and of literacy and schooling will be entirely new to many people in this country, and there is much useful material on the social geography of the U.S.A.—a topic that so far has received comparatively little attention.

There is a considerable though not altogether consistent geographical basis to the discussion; and 'Population analysis' can be recommended as a source-book that is likely to be of value to all students of America. One or two criticisms may be made. The treatment is at times superficial, perhaps inevitably in a book that attempts to survey the world and a sub-continent at the same time. This is most marked in a statement on the causes of the fall in the birth-rate during recent years. Only one reason is put forward—that of urbanization of the population—and few hints are given of the other factors involved. Scotsmen may wince on seeing a number of maps headed "Scotch" though the sub-title of one such map uses the more accepted version. W. B. F.

SOUTH AMERICA

ENCHANTED TRAILS. By Sir Christopher Gibson. *London: Museum Press*, 1948. 9×6 *inches;* 272 *pages; sketch-map and illustrations.* 16*s*

This volume is a breezy successor to 'Gran Chaco calling' which, it may be remembered, dealt with strenuous years of land development in the backwoods of the Paraguayan Chaco. Again it is a pleasure to read a book about South America written by someone who knows the country as the Argentine-born author does. 'Enchanted trails' is the book of a keen naturalist and sportsman, but it is more than that. Together with sidelights on the early history of the lands bordered by the Plata, are accounts of the inception of the enterprises of the Gibson family and the opening up of immense tracts of riverine and forestal regions of Argentina, Paraguay and Brazil.

Perhaps the most absorbing pages are those telling of a great estate (*fazenda*) cut from the virgin forests of Matto Grosso, that enormous Brazilian state which remains one of the least known parts of the world. The property lies between the arms of the Miranda and Aquiduana rivers (reached by way of Puerto Esperança on the Alto Paraguay), covers half a million acres and is "as big as Hampshire." The enclosing fences ran to thousands of miles, and the woods were full of wild creatures, among them jaguars that menaced the cattle breeders. Stock-raising difficulties were however lightened by days of shooting and fishing. The waters are full of dorado, pacú and "salmon," and despite many hardships it is plain that all the author's experiences were tinctured with hearty enjoyment. Notes in the appendix on the fish of the great rivers, the Paraguay, Alto Paraná and Alto Uruguay, with photographs of catches, will fill any European fisherman with envy. A clearer and more detailed map of the regions referred to in the book would be welcome. L. E. J.

THE GRASSLANDS OF LATIN AMERICA. By G. M. Roseveare. (Imperial Bureau of Pastures and Field Crops, Aberystwyth, Bull. 36.) *Aberystwyth*, 1948. 10×7½ *inches;* 291 *pages; maps, diagrams and illustrations.* 20*s*

The Imperial (now Commonwealth) Bureau has been collecting at Aberystwyth and indexing a great body of information on the provision of animal fodder in all parts of the world. These appear as *Herbage Abstracts*. Miss Roseveare is one of the abstractors, who has not presumably seen either the plants or the countries which she describes. Thus she must stick closely to the original and

quote the source. This scissors-and-paste method makes a solidly factual work which is heavy reading. As a bibliography it should be most valuable. The worth of the individual abstracts is naturally dependent on the reliability of the original article quoted and the critical faculty of the abstractor.

The writer starts with a general chapter on the natural regions which includes some interesting maps (none original) of the vegetation, soils and phytogeographical regions. These are on too small a scale to give much detail and do not agree with one another. The "pampean steppe" of Fig. 6 is the "woodland, grass and cultivation" of Fig. 5, while the "steppes and prairies" of Fig. 5 appear with somewhat different boundaries as "pampean woodlands" in Fig. 6. Good natural, Cool mountain, Semi-arid grasslands and savannahs are described and there are sections on poisonous plants, erosion, management, pests and research. The author states that 50 to 60 per cent. of the areas of some countries are affected by erosion, which is exceptionally grave in Argentina, especially in the middle western region where a heavy toll of the land has been taken and advancing desert threatens to overwhelm one of the best agricultural zones of the country. In Brazil erosion and exhaustion of the land are prominent in the old coffee plantation lands of Saõ Paulo, but here heavy rainfall is the cause as opposed to the combination of drought and wind as elsewhere. Green manures are sometimes used to cover the soil in Saõ Paulo, but the species are mostly different from those used in the Asiatic tropics. In Venezuela gully erosion of the most alarming type is to be seen in many of the hillier parts, due in some cases to tree felling. The author paints a gloomy picture of advancing ruin with little being done about it. A. H. G. A.

HOMEM E A GUANABARA. By Alberto Ribeiro Lamego. (Bibliotheca Geografica Brasileira, ser. A., no. 5, vol. 3.) *Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística*, 1948. 9×6 *inches;* xxxii+294 *pages; maps, diagrams and illustrations*

In a huge territory like Brazil, regional studies are of especial importance to the geographical understanding of the astonishing diversity of natural conditions present. For the region encompassing Rio de Janeiro (known aboriginally as the bay of Guanabara) geographers will find much valuable information in this book by the eminent and qualified Senhor Ribeiro Lamego. This is the third and most important volume in his series of studies on this maritime region; studies which are distinguished by an unusual combination of qualities. He shows a serious scientific approach, a sharp eye for telling evidence, a responsiveness to the human factor and a flair for drawing ample material from an astonishingly rich store-cupboard. As a guide he is both informed and enthusiastic. He has, to be sure, a theme on the grand scale, for the region embraces the Federal Capital, the seat of the Government, and that peer of cities which from the Portuguese epoch has been the hub of the country's life.

The work is divided into three sections—Earth, Man and Civilization. The first is a circumstantial description of the physical features, the geomorphology and climate in great detail. Drawing on his exceptional acquaintance at first hand with the geology of the region (as an official of the Ministry of Agriculture he has had 25 years' experience in the field) he gives a graphic panorama of the contrasted, even "convulsive," topography: the broad picture is that of faulted and violently eroded "gneissic rocks resting on an essentially granitic core." He adds a striking warning about the eventual disappearance by silting of the great bay itself unless the inexorable increase of deposits can be arrested. Never far from his mind is a sympathy with the struggle that geology has imposed on men. For a dominating feature of the plains is that they are per-

manently sunk: "everywhere the marsh has appeared as the enemy to be conquered . . . there has always been a struggle against water for the possession of soil—all deriving from geology. In the hills a struggle to retain soil, in the valleys to drain the circumambient marshes; and the islands could not have been populated save by the same struggle with water." Water has been the spur to growing civic ambitions.

The second section, Man, presenting an account of the human occupation of the region, relates the efforts of the pioneers (the bay was discovered in 1502 or 1504 by Portuguese seamen), the colonists, the merchant seamen, the agriculturalists, the industrialists, to adapt themselves to the demands of a difficult and contrasted environment. He describes in their historical development the maritime settlements, the peculiar problems of marsh-draining, transport, hill-cultivation, coffee-ranching and mining.

In the final section, Civilization, he examines the demographic and sociological phenomena that have taken shape in the region; that is, the economic and social organization and achievements that have sprung from the interplay of people of different racial background with their physical environment. Sr. Ribeiro Lamego here assigns himself a gargantuan task: scarcely less than an assessment of Brazil in terms of her people and her geography. Assuredly he provides fully furnished documentation on the geographic basis of the civilization founded around the bay of Guanabara; he makes credible and laudable the transformation of a natural harbour into the pride and admiration of the southern hemisphere; he gives due place to the influence of mountains, marshlands, islands and alluvial reefs, to the perhaps unparalleled harmony of racial intermixture, to the geniality of the climate, even (in a characteristically delicate aside) to the effect of natural scenic beauty on the inhabitants: "an enchantment and a grace almost feminine . . . and an energy almost wild and majestic . . . in the bays and mountains." Although making good much of his thesis of "telluric determinism," as he calls it, in the evolution of Rio de Janeiro, and having a keen focus on the mutual interaction of economic factors, social trends and racial psychology, he gives insufficient attention to political pressures, internal and external, and to those mental habits, achievements and interchanges that are largely if not wholly independent of geomorphic considerations. However, one cannot withhold one's admiration from a bold and imaginative attempt at a "geo-sentimental synthesis" of the population of the Guanabara whose "disconcerting psychology echoes the indisciplined panorama surrounding it." We may be more cautious in our deductions, but Sr. Ribeiro Lamego is for all that most skilfully informative on the solid background.

It remains to add that the author is a leading Brazilian geographer with a prolific record of fieldwork in government service and an impressive total of published works. It is also of more than passing interest that he was trained as a mineralogist at the Imperial College, University of London, during World War One.

The *Revista Brasileira de Geografia* for October–December 1944 contains a useful summary in English of the main geomorphological themes of the book.

L. R.

NEW ZEALAND

THE FACE OF OTAGO. Edited by B. J. GARNIER. *Dunedin: Otago Centennial Historical Committee*, 1948. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 82 pages; sketch-maps and illustrations*

To the small but growing body of distinctly geographic literature on New Zealand a useful addition is this publication of the Otago Centennial Historical

Committee. 'The face of Otago,' edited by B. J. Garnier, senior lecturer in geography at the University of Otago, follows "a standard geographical method which starts with a broad survey of the physical environment and proceeds to an account of the area region by region." Dr. Cotton gives a clear summary of the development and character of the present physiography of Otago in the first essay; B. J. Garnier briefly outlines the salient features of the climate of Otago, including a map of simplified climatic regions based on the Thornthwaite world classification; and J. T. Holloway completes the account of the natural landscape with a chapter on vegetation and soils. The distinctly new contribution which the book has to make to the geography of New Zealand is contained in the four regional essays which follow. K. W. Robinson, in his treatment of eastern Otago, creditably includes a map of regional subdivisions; B. J. Garnier describes the main characteristics of the central Otago landscape; and R. W. Willett contributes two essays on the Southland region and Fiordland. The twenty-six superb plates, most of them aerial obliques, enliven the reader's appreciation of the distinct landscapes of Otago and, with the bold and well-drawn maps, are themselves ample reward for the reader. The lack of an index and a bibliography mars this otherwise competent and attractive survey which has ably "summarized the results of 100 years of habitation."

W. P. P.

PHYSICAL GEOGRAPHY

WEATHER FORECASTING. By S. W. C. Pack. *London: Longmans, Green,* 1948. $9\frac{1}{2} \times 6$ *inches; 192 pages; diagrams and illustrations.* 25*s*

Here is a book which falls between two stools. It is neither sufficiently advanced to be of much service to the would-be professional weather forecaster nor sufficiently elementary for the layman who lacks training in mathematics and physics but wishes to understand the predictionary methods used in modern meteorology. We get the impression that the author has no clear picture of the type of mind he is out to instruct. Sometimes he appears to be addressing himself to the schoolboy mentality, as when he writes "Remember that water vapour is invisible" and "Atmospheric pressure decreases with increasing altitude"; at other times he assumes in his readers considerable scientific knowledge. A good deal of space is devoted to that invaluable forecasting tool the temperature-entropy diagram, but the difficult fundamental conception underlying its use is not properly explained; instead there is a recommendation that the interested student should "study the subject of thermodynamics and its application to the atmosphere." This is rather as if the writer of a book on poetry were to devote a chapter to Homer, outline the stories of the Iliad and Odyssey, and counsel the reader desiring fuller information about the siege of Troy and the adventures of Ulysses to learn Greek.

So far as it goes, the author's treatment of the principles of meteorology concerned in the practice of weather forecasting is adequate though not always lucid. The section on pressure systems is both clear and concise. Several slips occur in the chapters dealing with observational methods and instruments. The first maximum thermometer described on p. 27 is of a type that has been obsolete for almost a century. On p. 28 the action of the Dines anemograph should be attributed to the combined effects of pressure and suction instead of pressure alone. Some of the illustrations are unhappily chosen. Fig. 4·5 portrays an example of the unreliable Sixe's pattern maximum and minimum thermometer in the form designed for sinking in an iron tube to give a rough indication of the diurnal range of subsoil temperature; as a means of measuring

air temperature, which the student would take to be the purpose of the instrument pictured, such apparatus has long and rightly been discarded for official meteorological work. The small thermometer shelter shown in Fig. 4·6 is not a Stevenson screen, as stated, but the recent modification thereof known as the Bilham screen. On p. 34 both the upper and lower extremes of "shade" temperature on record for the British Isles are wrongly given. The maximum of 100° F. at Greenwich Observatory on 9 August 1911 should be replaced by the value of 100·5° F. registered at Tonbridge, Kent, on 22 July 1868. The minimum of −23° F. cited for Blackadder, Berwickshire, in the December of 1879 was obtained from an unsheltered and unverified Sixe's thermometer exposed on a post 2 feet above the ground and is now discredited. The accepted extremity of recorded cold in Great Britain is −17° F. at Braemar, Aberdeenshire, on 11 February 1895.

The chapter on long-range forecasting is very sketchy. There is no mention of the methods developed by the Multanovsky school in Russia or by Inigo Jones in Australia. The five-day predictions stated to have been first issued to the public in the United States in 1940 were anticipated in Germany by Bauer, who made them available some years before the war.

One regrets to find repeated use of the solecisms "warm temperature" and "cold temperature." Such lapses may be excusable in a newspaper article, but in a piece of instructional writing it should surely be recognized that it is the air which is warm or cold; the temperature is high or low. E. L. H.

CARTOGRAPHY

DER BEHAIM-GLOBUS ZU NÜRNBERG: eine Faksimile-Wiedergabe in 92 Einzelbildern. Der Erdapfel des Martin Behaim. By OSWALD MURIS. (*Ibero-Amerikanisches Archiv*, Berlin, vol. 17, nos. 1–2, April-July 1943.) $9^{1}/_{2} \times 7$ *inches;* 48 *pages plates;* 74 *pages text*

Martin Behaim's globe of 1492, which had from 1907 to 1928 been deposited by the Behaim family in the Germanisches Nationalmuseum, Nuremberg, was in 1937 purchased for the museum with the help of the German government. Its surface, which had suffered no less from previous restorations than from the wear and tear of time, then underwent a thorough cleaning and restoration under expert supervision. This provided German scholars with the opportunity to re-examine the globe, much of whose detail was now for the first time clarified; and, as a result of the discussion at the International Geographical Congress at Amsterdam in 1938 (*Comptes-rendus*, tom. 1, pp. 416–7), the task of preparing a reproduction in facsimile was entrusted to Herr Heinrich Winter, whose name does not however appear in the publication now noticed. The political circumstances which prohibited his association with it are explained without bitterness in an able review by Herr Winter in a recent issue of *Deutsche Literaturzeitung* (vol. 9, no. 6, June 1948, coll. 231–6). That he was prevented from carrying his project to completion must be a matter for regret, for it is apparent that both the method of reproduction and the accompanying text have suffered by deviation from his original plans.

Although the globe need no longer be taken seriously as a scientific record, yet as a "Kulturdokument" it can still provoke interest in three lights: as a masterpiece of the miniature-painter's art, as a technical achievement of outstanding skill and originality in the field of globe construction, and as a curious instance of the propagation of a legend which successfully deceived historical geographers for over four centuries. The miniatures and decorative details of Georg Glockendon—an exquisite fruit of the Renaissance art of Nuremberg—

await appreciation by the art historian. The construction of the globe is described by Professor Muris, who follows the thorough study by Dr. R. Uhden in his paper to the International Congress of 1938. This was probably the first globe to be constructed as a hollow sphere of papier-maché coated with plaster, and Behaim anticipated Mercator (1541) in the use of polar "calottes" (to avoid the difficulty of joining the apexes of the segments), Blaeu and other seventeenth-century cartographers in the use of segments divided at the equator, and M. Seutter (1710) in cutting away a narrow strip from the plaster at the junction of the parchment segments to form a smooth and continuous surface.

The greater part of Professor Muris's text is occupied by a description, in popular terms, of the globe and of the world-picture which it presents. Since Ravenstein's destructive criticism, Behaim's pretensions as cosmographer and as navigator have been generally discredited. His claim to have played a prominent part in the planning and execution of Diogo Cão's voyage of 1484–85 is in conflict with authentic records of his career and with the evidence of the globe itself, which gives a representation of the discoveries of Cão and Dias so distorted that, if not intended to serve Behaim's vanity, it can be regarded only as an illustration of his incompetence. Although Herr Winter insists that the Behaim legend was not "made in Germany," Behaim must nevertheless be considered a prophet who has received too much honour in his own country. That the legend is, or was in 1943, not yet dead in Germany is shown by Professor Muris's discussion of the globe. The date and circumstances of publication might explain a nationalist bias in his essay; it is none the less surprising to find him accepting Behaim's claim to have "taken part in Diogo Cão's expedition of 1484 and 1485, as the detailed legend at the south point of Africa proves"; and not less startling to read that the representation of Africa is "relatively correct." As Herr Winter points out, this judgment overlooks such gross errors as the laying down of the Congo mouth $17\frac{1}{2}^{\circ}$ too far south, and as the sharp eastward bend of the coast from Monte Negro which is placed 22° south of its true position. Professor Muris fails to face the dilemma that, if Behaim accompanied Cão, either he has falsified the record in his own interest or he possessed small qualifications as a nautical observer and cartographer. Other errors in the essay may be easily detected by examination of the globe: thus the assertion that there is no degree mesh overlooks the graduation of the equator and of the one meridian drawn, and it is twice stated that the Indian Ocean is shown as landlocked, whereas its southern margin appears as open sea spanned by a chain of islands. It is to be regretted that the editor has not printed a transcript of the inscriptions, for comparison of the present reproduction with that of Ravenstein reveals many striking divergencies, evidently due for the most part to overpainting or renewal of the legends which has been removed since Ravenstein's time.

But the facsimile is after all the main thing. Here we have the first reproduction by photography of the whole surface of Behaim's "Erdapfel," executed after its first adequately controlled cleaning and restoration. A coloured photograph of the whole globe is followed by 90 rectangular half-tone illustrations, on which the surface is reproduced to a scale about nine-tenths that of the original. Each illustration, $10 \times 13{\cdot}5$ cm. in size, represents an area of about 13×18 cm. on the globe and conveniently overlaps its neighbours. This division of the subject overcomes the technical difficulty of photographing a curved surface, and the reproductions are extremely clear and unspoilt by reflection. They are arranged in eight horizontal belts, those representing the polar "calottes" having each seven rectangles, the remainder thirteen. Such

an arrangement cannot be considered as satisfactory as that proposed by Herr Winter, who intended to dispose his illustrations in twelve vertical series, corresponding to the twelve segments or gores into which a globe surface is normally divided (although Behaim's has in fact only eight); the equator would then have appeared as a horizontal and the single meridian as a vertical line—advantages which, with others, the photographer has sacrificed. With these reservations, the present reproduction can be confidently recommended to the study of the palaeographer and the historian of cartography. R. A. S.

THE REGIONAL ATLAS. By JOHN BARTHOLOMEW. Introduction by Professor A. G. Ogilvie. *Edinburgh: Geographical Institute*, 1948. xvi+160 *pages maps;* 96 *pages index.* 45*s*

This is an atlas of very convenient size, eleven inches by nine, and comfortably light as it weighs only two pounds. The matter of weight is mentioned because the writer of this notice has occasionally to consult an atlas which weighs more than seventeen pounds! In his introduction Professor Ogilvie gives reasons for the use of the word "Regional" in the title. He remarks that "various kinds of region exist in virtue of physical qualities and also of human groupings and activities," and there is at the beginning of this Atlas a useful short series to illustrate such regions, showing zones of temperature, structural regions, land utilization and so on. But the great majority of the maps are of the normal kind, suitable for a work which will be used chiefly for ordinary reference purposes. The maps are of the cartographic excellence that we have learnt to expect from the firm of Bartholomew. And here it may be appropriate to say how much geographers owe to the draughtsmen on stone and zinc, and to all who share in the technical production of a map. Some of us are too apt to take technical excellence of this kind for granted. It is, as a fact, the result of years of devotion to trades which require no small degree of skill and aptitude.

The 160 sheets of the Atlas are mostly drawn on scales which are multiples of one to one million, and this is a simplification to be commended. Once we have got used to the million scale—about 16 miles to one inch—we can easily grasp the relation of this to the smaller scales of one to two million, one to three million and so on. The same system of layer tints to indicate the same range of altitude is used almost throughout—another useful simplification.

The projections that have been used appear to be generally suitable, though their names are not given except in a few cases. The sheet showing World Airways is plotted on a Zenithal Equidistant projection centred on London. The map of the South Polar region is, no doubt, plotted on a similar projection centred on the South Pole. It would add to the technical interest of the Atlas if, in future editions, the projections used for the larger areas were described. The interesting first sheet of the Atlas, entitled Regions of Population, is plotted on what is described as the "Atlantis projection," which appears to be a modification of the Transverse Mollweide in which the poles are shifted so as to bring the centre of the land masses towards the centre of the plate. As compared with the Transverse Mollweide, which was published some twenty years ago, the representation of South America is much improved, but India and Australia have suffered. The position of the fabled "Atlantis" is unobtrusively shown by a coloured line enclosing the Canary Islands, Madeira and the Azores; a curious feature. There are a few similar outlines in the Pacific.

This atlas contains some maps not always to be found in atlases, such as those of Iceland, New Guinea, and a useful map of the Islands of the Pacific. The Atlas is admirably designed, drawn and printed, it is handy to use and is a reliable, up-to-date work of reference. C. F. A.-C.

AN INTRODUCTION TO THE STUDY OF MAP PROJECTIONS. By J. A. STEERS. (7th edition.) *London: University of London Press*, 1949. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xxvii+298 *pages; maps and diagrams.* 18*s*

This well-known manual has grown appreciably in the successive editions that have appeared since 1927; the material has now been rearranged and Professor Debenham has written a new foreword. The division into two parts, simple and advanced, has, with advantage, been dropped and related projections are brought together. Some of the more advanced matter does not however accord very well with the simple treatment that has always been a feature of the book. There are few additions to the 1946 edition, but the figures have been redrawn and the paper is no longer of wartime quality. The account of the Ordnance Survey maps and projections has been extended to include the Grid System and there is a note on the post-war programme of remapping; the subject is further dealt with in a new section on the choice of projections for topographical maps.

There are a few misprints, some of them repeated from earlier editions. The statement that the meridians of a simple conic with two standard parallels do not meet in a point has been corrected; but it is still stated (p. 118) that the meridians of the conical orthomorphic radiate from an apex which is the pole. The erroneous table for Eckert's Fourth projection (derived from Eckert's original paper in *Petermann's Mitteilungen*) has been corrected in an erratum slip to this edition. F. G.

ECONOMIC AND SOCIAL GEOGRAPHY

FARMING FOR INDUSTRY. By R. O. WHYTE. *London: Todd Publishing Group*, 1948. $7\frac{1}{2} \times 5$ *inches;* 160 *pages; illustrations.* 7*s* 6*d*

The work of the farmer is so constantly associated in the public mind with the production of food directly or indirectly for human consumption that the importance of agriculture in providing raw materials for a great variety of industries is liable to be overlooked. In this small but most informative book, Dr. Whyte is concerned only with these raw materials of industry. He makes two interesting generalizations. In the first place there has been a marked tendency for these industrial crops to be grown under a system of monoculture—cotton, tobacco, jute—whereas they are in the future likely to be grown much more as part of regular rotations. In the second place, increasing attention to fewer and better animals must have repercussions on the amount and quality of mohair, wool, hides and skins. Further, the old days of "cheap" labour—with low standards of pay and living—are ending and this must affect plantation production and again lead to a greater proportion of industrial raw materials being produced on mixed farms.

The chapter on leather is particularly instructive and includes much information on types of leather not readily accessible elsewhere. Vegetable oils, tobacco, rubber from farm crops (especially Kok-saghy, or Russian dandelion, from Russia), plant and animal fibres and a wide variety of miscellaneous products are all considered, but the book does not touch plantation agriculture. L. D. S.

A HANDBOOK OF TROPICAL AGRICULTURE. By G. E. MASEFIELD. *London: Geoffrey Cumberlege, Oxford University Press*, 1949. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii+196 *pages.* 12*s* 6*d*

The handbook should be of much value to administrators and travellers in the tropics who wish to take an intelligent interest in the cultivation of the soil.

Hitherto no simple compendium of information on the crops and farm animals of the tropics has been available for the general reader. Mr. Masefield has attempted to fill this very serious gap within the narrow limits of less than two hundred pages. The subject has of necessity been much compressed. Rice, for instance, has been allowed but three pages, and crops of minor importance are sometimes given only three or four lines. The value of the book lies in the fact that on a wide range of agricultural subjects, be it the daily milk yield of goats in Africa, or the method of tapping rubber trees in Malaya, or the nature of soil erosion, some information is provided. It would be irrelevant to point out omissions or cavil at generalizations, since they are inevitable in so compressed a treatment of a wide subject, and the author is to be congratulated on the well-balanced form into which he has gathered his material. The omission of illustrations, due no doubt to expense, does however detract from the value of the book. It is to be hoped that the success of the first edition will permit their inclusion when the book is reprinted. R. S. R.

A SYSTEMATIC REGIONAL GEOGRAPHY. Vol. 3, A world survey from the human aspect. By J. F. UNSTEAD. *London: The University Press*, 1948. 8½×6 *inches;* xii+451 *pages; maps, diagrams and illustrations.* 15*s*

A lifetime of teaching experience goes into Dr. Unstead's new 'Systematic regional geography,' of which the book under review is Volume 3, following Volumes 1 (the British Isles) and 2 (Europe). The appearance of a World Survey, devoid of regional treatment, in the middle of a series designated "regional" seems illogical but does not detract from the usefulness of the book, which can stand alone. The treatment is conventional but has many new touches. Part 1 (138 pages) deals with the natural conditions, relief, structure, minerals, climate, soil and vegetation. Part 2 (204 pages) adds human developments and closes with two interesting chapters defining and describing cultural regions. In this section are included, with ample justification, such inescapable regional realities as political ideologies, social traditions and prejudices, and comparative standards of living which might be regarded by some as outside the scope of geography. Part 3 (78 pages) attempts outline regional syntheses, drawing together Parts 1 and 2, but since the criterion of the region is climatic there is inevitably an emphasis on agricultural practice and rural modes of life to the relative neglect of the industrial and urban. An attractive and informative series of diagrams of seasonal rhythm in nature and in man's activities adds greatly to the value of this section.

The text is generously illustrated with diagrams and maps, photographic plates being used sparingly to illustrate racial types and characteristic styles of architecture and dwellings in the major cultural regions. The world maps are drawn on Eckert's area-true projection centred on 30° E. The marginal bulges of the oval net are amputated, eliminating the high latitudes and the watery wastes of the central Pacific; the resultant bevelled rectangle fits conveniently the page size and economically displays the important land areas with less distortion than is involved in the commonly used Mollweide and Sinusoidal projections.

In a book of this kind, designed as a text-book summary of the human aspects of geography for use at the post-matriculation stage, the author must attempt to cover the whole canvas; depth of penetration must be sacrificed to breadth of view, and the problem is what to leave out rather than what to put in. Dr. Unstead omits very little, leaving it to the reader to choose what to skip. The result is a generous fifteen-shillingsworth which admirably fulfils its purpose. A. A. M.

HISTORICAL GEOGRAPHY

THE OVERLAND MAIL: a postal historical study of the mail route to India. By JOHN K. SIDEBOTTOM. *London: George Allen and Unwin (for the Postal History Society)*, 1949. 7½×10 *inches;* xii+174 *pages; maps and illustrations.* 25*s*

This record of the "Overland Mail"—to India—covers the comparatively short period when our growing responsibilities in the Orient necessitated quicker and better organized means of communication than by the long sea passage round the Cape—*before* the opening of the Suez Canal; "overland" being across Europe to the Mediterranean and over the land-bridge between Africa and Asia from Alexandria to Suez. There had been other, older and even more direct overland routes to the East with their postal services, but, efficient as they were, they had never become "official." Of special interest to philatelists, the book also serves a useful purpose in putting before the ordinary reader a most interesting period in the history of postal communications. Earlier records carry the reader back to the days when the West had to wait a year (or two) for a reply to a letter to India and was lucky if it got one. Only a century ago the round voyage to India might last a year. Nowadays we demand instant connection with India by radio-telephone and expect a letter to be delivered in four days.

The pioneer of this early nineteenth-century attempt at a short-cut was Lieutenant T. F. Waghorn, R.N., for some time a pilot on the Hoogli in the Bengal Marine Service. He must have been a man of great parts and exceptional perseverance, for in spite of official antagonism and discouragement he succeeded in being "the first to demonstrate the practicability beyond dispute of the route over Egypt for regular use on a large scale," and having failed to get the support of the East India Company he set up his own Overland Agency, offering to carry letters at 5*s*. each to Bombay, the transit averaging 74 days out and 64 for return. After a somewhat chequered career in Egypt, and being ousted by competition, he transferred his attention to reorganizing the transit of passengers and mails across Europe. It would appear that what should have been "a great Imperial enterprise" became the obsession of a single individual who had the vision to foresee its possibilities. Lieutenant Waghorn gave his life and his private fortune in the cause, and got no thanks until now the Postal History Society puts on record his remarkable achievements. The book is well indexed, documented, and has useful appendices on diverse matters connected with this and other routes such as the Euphrates Valley project. D. C.

GENERAL

THE SPLENDID HILLS: the life and photographs of Vittorio Sella (1859–1943). By R. CLARK. *London: Phoenix House*, 1948. 11½×9 *inches;* x+118 *pages; illustrations.* 35*s*

ROCKY MOUNTAINS. By FRANK S. SMYTHE. *London: A. and C. Black*, 1948. 11½×9 *inches;* 149 *pages; map and illustrations.* 30*s*

The author's preface to 'The splendid hills' is an interesting and often entertaining account of Vittorio Sella's development from an enthusiastic amateur into a world-famous professional photographer of mountains. Sella began in 1879, using collodion plates (30×36 cm.) which of course had to be sensitized and processed at the time of photography. Although he bought a roll-film camera in 1892, all his major work was carried out on plates. It is difficult to

remember, while browsing over the eighty examples of his photographs here reproduced, that most of them were only made possible by manhandling loads of equipment which, in Sella's words, "would certainly have been refused by any guide of the civilized Alps." In addition to interesting historical records, the plates include reproductions of Sella's classical photographs taken in the Alps, the Caucasus, Mount St. Elias, Ruwenzori and the Himalaya.

Frank Smythe, using film cameras which, at a pinch, can be carried in the pocket, records mountains with the same understanding eye and flawless technique. However, he has not, in 'Rocky Mountains,' been quite so well served in the quality of the reproductions. The forty-eight black-and-white half-tone reproductions of his Rocky Mountain photographs are on the "mealy" side and appreciably fewer tones between white and black have been retained than in the plates of 'The splendid hills.' The sixteen colour half-tone reproductions from his "kodachrome" photographs are in the crude picture-postcard tradition. This is unfortunate, for Smythe's justifiable enthusiasm for colour photography becomes correspondingly difficult to understand. It is quite possible to produce from miniature camera colour transparencies excellent colour half-tone plates, and when, as in mountain colour photography, much of the beauty of the record depends on subtle differentiation of hue and tone, fine etching should be by automatic rather than hand-controlled methods. However, the text does much to compensate for the somewhat disappointing quality of the reproductions and, as usual, the author has much sound advice on photographic technique to offer. An interesting commentary accompanies each illustration. D. A. S.

ADDITIONS TO THE LIBRARY AND MAP ROOM

EUROPE

SCIENCE IN LIBERATED EUROPE

By J. G. Crowther. $8\frac{1}{2} \times 6$. pp. 336. *London: Pilot Press*, 1949. 18*s*

The author's aim is to show the effect of the occupation on science in France, Denmark, Holland and Czechoslovakia, and present plans for its development.

THE COUNTY BOOKS

SHROPSHIRE. By Edmund Vale. pp. 236.
WORCESTERSHIRE. By L. T. C. Rolt. pp. 296.
STAFFORDSHIRE. By Phil Drabble. pp. 236.

$8\frac{1}{2} \times 5\frac{1}{4}$. Illustrations and sketch-maps *London: Robert Hale*, 1949. 15*s* 6*d each*

'The County Books' aim at conveying the individuality of each county, rather than at giving a comprehensive topographical description. The treatment is also individual, reflecting the interests and special knowledge of the authors, all equipped with first-hand acquaintance with the areas they treat. The illustrations are varied and attractive.

A PICTURE BOOK OF THE WHOLE COAST OF ENGLAND AND WALES

By J. A. Steers. $9\frac{1}{2} \times 6\frac{1}{2}$. pp. vii+36. Map, diagram and plates. *London: Cambridge University Press*, 1948. 10*s* 6*d*

148 photographs, including those published in the author's "Coastline of England and Wales," with an essay on the changing coast.

WHITE HORSES AND OTHER HILL FIGURES

By Morris Marples. 9×6. pp. 223. Diagrams and illustrations. *London: Country Life*, 1949. 21*s*

GUIDE TO THE GEOLOGY OF THE EAST MIDLANDS

Ed. by C. E. Marshall. 9×6. pp. 111 and plates. Maps and diagrams. *Nottingham: University of Nottingham*, 1948

OFF TO THE LAKES: A LAKELAND WALKING YEAR

By Jessica Lofthouse. 9×6. pp. 280. Illustrations. *London: Robert Hale*, 1949. 12*s* 6*d*

SURFACE PROBLEMS IN THE SEARCH FOR OIL IN SUSSEX

By Rev. J. W. Reeves. (*Proc. Geol. Assocn.* 59 (1948) 234–269; diagrams)

THE SOCIAL GEOGRAPHY OF DUBLIN

By J. P. Haughton. (*Geogr. Rev.* 39 (1949) 257–77; maps and illustrations)

DAS SEMMERINGGEBEIT

By Johann Sölch. (*Wiener Geogr. Studien* 16 (1948) pp. 42; maps and illustrations)

BEVOLKERUNGSGEOGRAPHISCHE UNTERSUCHUNGEN IM UNTERINNTAL

By Franz Fliri. (*Schlern-Schriften* 55.) $9\frac{1}{2} \times 7$. pp. 98. Diagrams. *Innsbruck: Wagner*, 1948

BEITRÄGE ZUR OROGRAPHIE DER HOHEN TAUERN

By Norbert Krebs. (*Mitt. Geogr. Ges. Wien* 90 (1948) 20–39)

LAPIN HULLU: eine Winterfahrt durch lappische Wildmarken

By L. Kattwinkel. 2nd ed. $9\frac{1}{2} \times 7\frac{1}{2}$. pp. 120. Illustrations. *Braunschweig: Georg Westermann*, 1948

An interesting account of a winter journey with reindeer across Finnish Lapland from Pallastunturi to Petsamo, with good photographs

LES PAYSANS DE MORETTE: un siècle de vie rurale dans une commune du Dauphiné

By J. Garavel. (*Cahiers de la fondation nationale des sciences politiques* 2.) $9\frac{1}{2} \times 6$. pp. 122. Sketch-map and diagrams. *Paris: Armand Colin*, 1948

The study shows, among other conclusions, that the peasants adhere doggedly to their traditional mode of life, and that depopulation is due to migration to other rural areas, not to the attraction of the great cities.

RICHESSES ET DÉVASTATIONS DE LA FORÊT LANDAISE

By Louis Papy. (*Cahiers d'Outre-Mer* 1 (1948) 297–333; maps and illustrations)

The destruction of the Landes forest, and the decay of the timber exports have reduced large areas to a desert.

LES ALPAGES DU JURA FRANÇAIS

By René Lebeau. (*Études Rhodaniennes* 23 (1948) 185–204; maps and illustrations)

DIE MARBURGER LANDSCHAFT: Gestalt und morphologische Entwicklung

By Helmut Blume. (*Marburger Geogr. Schriften* 1.) 8×6. pp. xii+306 Map and diagrams. *Marburg: Elwert-Grafe und Unzer*, 1949. *DM*.15.50

JUBILEUM-AFLEVERING. Tijds. van het K. Nederland. Aardrijkskundig Genootschap (55, Juli-Sept. 1948. pp. 437–752. Illustrations and sketch-maps)

This enlarged number, issued to mark the Jubilee of the Society, consists of articles on the human geography of the Netherlands and on the interpretation of air photographs. All are illustrated by many fine photographs from the air.

ZUR WALDSTEPPENFRAGE IN DER SOWJETUNION

By W. Leimbach. (*Erdkunde, Bonn*, 2 (1948) 238–56; maps)

DIE STEPPENSCHLUCHTEN SÜDRUSSLANDS

By W. F. Schmidt. (*Erdkunde, Bonn*, 2 (1948) 213–30; illustrations)

CONTRIBUTIONS TO THE ANTHROPOLOGY OF THE SOVIET UNION

Compiled by Henry Field. (*Smithsonian Misc. Collections* 110 (1948) no. 13, pp. 244; illustrations)

Translations and summaries of recent Soviet papers on the archaeology and physical anthropology of the Union.

EL RELIEVE DEL ALTO VALLE DEL ARAGON

By N. Llopis Lladó. (*Pirineos* 3 (1947) 81–166; maps and illustrations)

AGAIN SWITZERLAND

By Frank S. Smythe. 9×6. pp. viii+248. Illustrations. *London: Hodder and Stoughton*, 1947. 20*s*

ALPINE TRAGEDY

By Charles Gos. $9\frac{1}{2}\times6\frac{1}{4}$. pp. x+282 and plates. Maps and illustrations. *London: Allen and Unwin*, 1948. 18*s*

Accounts of fatal accidents in the Alps during the nineteenth century.

AN ACCOUNT OF THE LONG FIELD MEETING HELD IN SWITZERLAND, SEPT. 1947

By M. K. Wells and others. (*Proc. Geol. Assocn.* 59 (1948) 181–228; maps and illustrations)

Contains results of recent research in the geology of Switzerland.

THE ROOT OF THE ALPS

By J. H. F. Umbgrove. (*Proc. K. Nederland. Ak. Wetens.* 51 (1948) 761–75; block diagrams)

A criticism of the theory of Alpine tectonics based on an overthrust from the south.

LA VAL D'ENTREMONT: étude sur sa vie économique

By Karl Suter. (*Bull. Soc. Neuchâtel. de Géogr.* 55 (1948) 13–38)

THE AZORES AND ATLANTIC FLYING

By Lewis Spolton. (*Geography* 33 (1948) 120–7; diagrams)

ASIA

THE 'ANAZAH TRIBES

By Touvia Ashkenazi. (Repr. fr. *Southwestern J. of Anthrop., Albuquerque*, 4 (1948) 222–39)

CHINA OHNE MAUER

By Herbert Tichy. $9\frac{1}{4}\times6$. pp. 200. Illustrations. *Vienna: Verlag L. W. Seidel*, 1948. $3.25

Studies of Chinese life and culture, based on many years' wanderings through the country, and illustrated with attractive drawings by a Chinese artist.

NOTES ON THE GEOLOGY OF THE ELBURZ MOUNTAINS, NORTH-EAST OF TEHRAN

By E. B. Bailey, R. C. B. Jones, and S. Asfia. (*Quart. J. Geol. Soc.* 104 (1948) 1–42; maps)

MALARIA, IRRIGATION AND EROSION IN CENTRAL SYRIA

By N. N. Lewis (*Geogr. Rev.* 39 (1949) 278–90)

GEOLOGICAL EXPLORATIONS IN WESTERN TIBET

By Erik Norin. (*Reports Sc. Expedn. to N.W. provinces of China*, III, 7.) $11\frac{1}{2}\times9$. pp. xii+214. Plates. *Stockholm*, 1946

AFRICA

LE MODELÉ DES MONTS NIMBA (A.O.F.) DANS SES RAPPORTS AVEC LES SOLS ET L'ÉVOLUTION DE LA VÉGÉTATION

By Raymond Schnell. (*Annales de Géogr.* 57 (1948) 213–8; illustrations)

GÉOGRAPHIE AGRAIRE AU SÉNÉGAL: la cercle de Louga

By Jean Suret-Canale. (*Cahiers d'Outre-Mer.* 1 (1948) 348–67; sketch-maps and illustrations)

LE RÉGIME ÉCONOMIQUE DU CONGO BELGE

By M. Moeller de Laddersous. (*Bull. Soc. R. de Géogr. d'Anvers* 62 (1948) 22–40)

The same number contains an article by G. Hostelet on the importance of the Congo in Belgian economy.

GEOLOGY OF NORTH, WEST AND CENTRAL NJOMBE DISTRICT, SOUTHERN HIGHLANDS PROVINCE

By G. M. Stockley. (*Tanganyika Terr. Geol. Division, Bull. no.* 18 (1948) 68 pp.; maps and diagrams)

THE ROMAN ROADS AND MILESTONES OF TRIPOLITANIA: DISCOVERIES AND RESEARCHES IN 1947

By R. G. Goodchild. 12×8. pp. 32. Maps and illustrations. *Tripoli: Dept. of Antiquities, B.M.A.*, 1948

A HABITAÇÃO INDIGENA NA GUINÉ PORTUGUESA

By A. Teixeira da Mota and M. G. Ventim Neves. (Centro de Estudos da Guiné Portuguesa, 7.) 9×6. pp. 542. Illustrations. *Bissau* (pr. *Lisboa*), 1948

LAND HOLDING AND LAND USAGE AMONG THE PLATEAU TONGA OF MAZABUKA DISTRICT

By W. Allan and others. (*Rhodes-Livingstone Papers*, no. 14.) 9½×6. pp. 192. *Oxford University Press*, 1948

KLIMABEDINGTHEIT UND WIRTSCHAFTSGEOGRAPHISCHE STRUKTUR DER FARMWIRTSCHAFT UND FARMSIELDLUNG IN SÜDWESTAFRIKA

By J. F. Gellert. (*Erdkunde, Bonn*, 2 (1948) 282–302)

AMERICA

CHANGEMENTS DE STRUCTURE DANS LA GÉOGRAPHIE HUMAINE DES ÉTATS-UNIS

By Jean Gottmann. (*Ann. de Géogr.* 57 (1948) 131–45)

LATE PLEISTOCENE AND RECENT CHANGES OF SEA LEVEL ALONG THE COAST OF SANTA BARBARA COUNTY, CALIFORNIA

By J. E. Upson. (*Amer. J. Sc.* 247 (1949) 94–115; maps)

COMPENDIO Y DESCRIPCIÓN DE LAS INDIAS OCCIDENTALES

By A. Váquez de Espinosa; trsl. by C. U. Clark. (*Smithsonian Misc. Collns.* 108 (1948) xii+802 pp.)

The first publication of a MS. account written in the early seventeenth century, of importance for the history of Spanish America.

LA PRECISION DE LOS MAPAS COMPILADOS: un capitulo de la historia cartografica del Territorio Argentino

By G. Schulz. (*Inst. de Estudios Geogr., Tucuman, Ser. de geogr.*, 13, 1948.) 9½×7. pp. 42

BRAZIL. (United Nations Series.)

Ed. by Lawrence F. Hill. 9×6. pp. xxi+394. Maps and illustrations. *University of California Press* (*Cambridge University Press*), 1947. 27*s* 6*d*

DELIMITAÇÃO DA AMAZONIA PARA FINS DE PLANEJAMENTO ECONOMICO

By L. de Castro Soares. (*Rev. Brasil. de Geogr.* 10 (1948) 163–210; maps and illustrations)

A study of the limits of 'Amazonia,' in relation to its economic development. The delimitation takes into account hydrography, communications, and economic zones of influence.

EXPLORACION DEL PARAMO DE LAS PAPAS: monografia historico-geografica, con el total esclarcimiento de las fuentes de los rios Magdalena y Caqueta

By H. Justo Ramon. (*Bol. Soc. Geogr. de Colombia* 7 (1947) 357–84; illustrations)

Determination of the true sources of the rivers Magdalena and Caqueta.

LAS CABECERAS DE LOS RIOS MAGDALENA Y CAQUETA EN EL MACIZO COLOMBIANO

By E. Grosse. (*Bol. Soc. Geogr. de Colombia* 7 (1947) 419–33; illustrations)

AUSTRALASIA AND PACIFIC

BIOCLIMATIC CONTROLS IN WESTERN AUSTRALIA

By J. Gentilli. (Repr. fr. *W. Australian Naturalist* 1 (1948) 12 pp.; diagrams)

GEOMORPHOLOGY OF THE PELSART GROUP OF THE HOUTMAN'S ABROLHOS ISLANDS

By R. W. Fairbridge. (*J.R. Soc. W. Australia* 33 (1946–7) 1–44; illustrations and diagrams)

THE SOILS AND AGRICULTURE OF THE WAIMEA COUNTY, NELSON, N.Z.

By Sir T. Rigg. (*Rept. Australian Assocn., Adv. of Science*, 1947, 236–49)

DROWNED ANCIENT ISLANDS OF THE PACIFIC BASIN

By H. H. Hess. (*Ann. Rept. Smithsonian Inst.* 1947, 281–300; diagrams)

Discusses the possible formation of a number of flat-topped peaks in the floor of the North Pacific. They are truncated by a level surface approximately 4500 feet below present sea-level.

FIJIAN VILLAGE: an anthropologist's account of Fijian institutions, ethics, and personalities

By Buell Quain. 9½×6½. pp. xvii+459. Illustrations and diagrams. *Chicago: University Press* (*Cambridge University Press*), 1948. 27*s* 6*d*

IT'S A BIGGER LIFE

By Lucille Iremonger. 9×6. pp. 192. Illustrations. *London: Hutchinson*, 1948. 18*s*

Reminiscences of life in the Gilbert and Ellice Islands just before the Japanese occupation.

HAWAII: a century of economic change, 1778–1876

By Theodore Morgan. 9×6. pp. xi+ 260. Diagrams and illustrations. *Harvard: University Press (Oxford University Press)*, 1948. 22*s*

THE RYUKYU PEOPLE: a cultural appraisal

By M. T. Newman and R. L. Eng. (*Ann. Rept. Smithsonian Inst.* 1947, 379–405; illustrations)

POLAR REGIONS

ANCIENT ARCTICA

By A. J. Eardley. (*J. of Geology* 56 (1948) 409–36; maps)

The paper reviews the geology of the Arctic in regard to the problem of the relation of Eurasia to North America and Greenland. The area, particularly the Arctic archipelago, holds good petroleum possibilities.

THE SEARCH FOR THE NORTH POLE

By Nellis M. Crouse. $9\frac{1}{2}\times6\frac{1}{2}$. pp. 376. Map in pocket. *New York: Richard R. Smith*, 1947. $4.50

A series of accounts of nine polar explorers, from Elisha Kent Kane to R. E. Peary, to whom one-fifth of the book is allotted.

THE HISTORY OF THE ARCTIC RESEARCH LABORATORY, POINT BARROW, ALASKA

By M. C. Shelesnyak. (*Arctic* 1 (1948) 97–106; illustrations)

DAILY WEATHER CHARTS EXTENDING FROM AUSTRALIA AND NEW ZEALAND TO THE ANTARCTIC CONTINENT

By E. Kidson (*Australasian Antarctic Expedn.* 1911–14; *Sc. Rept., Ser. B., v.* 7.) 12×9. 32 pp. and charts. *Sydney: Govt. Printer*, 1947. £2

GENERAL

DAS WESEN DER KONTINENTE

By O. Jessen. (*Münchner Hochschulschriften*, 3) 9×6. pp. 28. *München: Leibniz Verlag*, 1948

A comparative study of the main characteristics, physical and human, of the continents.

DIE ERDE UND DAS LEBEN: eine Einführung in die allgemeine Erdkunde

By Kurt Gebauer. 2nd ed. $8\frac{1}{2}\times5\frac{1}{2}$. pp. 276. Illustrations and maps. *Braunschweig: Georg Westermann*, 1948

An introduction to general geography, with most emphasis on the physical aspects, designed to give German readers an understanding of their country and the surrounding world. Interspersed in the text are illustrative extracts from German writers and notes on German scientists. A section of good photographs.

TECTONIC PATTERNS IN THE EARTH'S CRUST

By E. S. Hills. (*Rept. Australian Assocn. Adv. of Science*, 1947, 290–302; sketch-maps)

THE CLIMATIC RECORD: its content, limitations, and geographic value

By C. F. Brooks. (*Ann. Assocn. American Geogr.* 38 (1948) 153–68)

MARITIME WELTGESCHICHTE: Altertum und Mittelalter

By Egmont Zechlin. 9×6. pp. 500. Maps. *Hamburg: Hoffmann und Campe Verlag*, 1947

THE STORY OF THE BRIDGE

By F. W. Robins. $8\frac{1}{2}\times5\frac{1}{2}$. pp. 278. Illustrations. *Birmingham: Cornish Bros.*, 1948

Deals with the history of bridges from the social rather than the engineering aspects. Numerous interesting photographs.

ATLASES AND MAPS

WORLD

COLLINS-LONGMANS STUDY ATLAS. 7th Edition. *London: Longmans, Green, and Wm. Collins*, 1948. *Price* 7*s* 6*d*

WORLD CRUDE OIL PRODUCTION AND REFINING CAPACITY 1947. 1:41,000,000. *London: Petroleum Information Bureau*, 1948

ADMIRALTY CHARTS. 2 New Charts, 11 New Editions, 27 Large Corrections, 4 "Decca" Lattice Charts. *London: Hydrographic Dept., Admiralty*, 1948–49

EUROPE

EUROPE. Carte de l'Europe au 1,000,000^{e}. Type Normal. 45 sheets. *Paris: Institut Géographique National.* 1942–48

BRITISH ISLES 1:1,786,752. *Washington: National Geographic Society*, 1949

GREAT BRITAIN. Ordnance Survey. Six-inch map on National Sheet Lines 53/36 N.E., price 4*s*; Six-inch map, 90 sheets, price 2*s* each sheet; 1:25,000 or about $2\frac{1}{2}$ inches to 1 mile, 88 sheets, price 2*s* each sheet. *Chessington*, 1948–49

GREAT BRITAIN 1:625,000. Gas Act 1948. Areas of Gas Boards superimposed on map of Administrative Areas. *Chessington:* Ordnance Survey, 1948, 2 sheets 5*s* each

ENGLAND AND WALES. National Nature Reserves and Geological Monuments. 1:63,360. 61 sheets. *London:* Ministry of Town and Country Planning, 1948

Shows 72 National Nature Reserves and 42 Geological Monuments

SCOTLAND. Geological Survey 1:63,360. Sheet 53, price 3*s* 9*d*; 1:253,440. Sheets 3, 5, 9, 12, 14, 15, 16, price 3*s* per sheet. *London*, 1948

CZECHOSLOVAKIA. Dr. Stanislav Vorel, Physical and Economic Conditions of Kladsko in Maps. Prague: Association of Friends of Kladsko, 1948. 16 maps on the scale of 1:400,000

FRANCE 1:200,000 7 sheets; 1:50,000 4 sheets. *Paris: Institut Géographique National*, 1946–47

GERMANY. ZONES OF OCCUPATION, 1947. 1:1,490,000. *Washington: Dept. of State, Map Division*, 1947

NORWAY. A General View based on the Map on 1/M. 8 sheets. *Oslo: Norges Geografiske Oppmåling*, 1948

NORWAY. Magnetisk misvising, Inklinasjonen, Horisontal - Intensiteten, 1941. *Oslo: Norges Sjøkartverk*, 1945

NORGES SJØKART 124. Den Norske Kyst. Sognefjorden fra Fresvik til Gudvangen og Flaam. 1:50,000. *Oslo: Norges Sjøkartverk*, 1947

AFRICA

AFRICA. Afrique, 1/2M. 1 sheet; Croquis de l'Afrique Française au 1,000,000e. 4 sheets; Afrique du Nord et Régions Sahariennes au 500,000e. 18 sheets. *Paris: Institut Géographique National*, 1941–48

AFRICA. Central and East 1/4 M. *Edinburgh: John Bartholomew & Son Ltd.*, 1948. 6*s* 6*d mounted*

GAMBIA 1:50,000. 8 sheets. *Teddington: Directorate of Colonial Surveys*, 1948

GOLD COAST. Volta River Area 1:5,000. 3 sheets. *Teddington: Directorate of Colonial Surveys*, 1948

AMERICA

UNITED STATES. U.S. Geological Survey. Quadrangle Topographic Sheets: 1:24,000 148 sheets; 1:31,680 11 sheets; 1:62,500 30 sheets. *Washington*, 1948

CANADA. National Topographic Series. 1:63,360 4 sheets; 1:126,720 1 sheet: 1:253,440 1 sheet; Newfoundland-Avalon Peninsula. 1:125,000 8 sheets. *Ottawa: Department of Mines and Resources*, 1948

ARGENTINA. Carta Topográfica de la República Argentina 1:25,000. 2 sheets. *Buenos Aires: Instituto Geográfico Militar.* 1948

BRAZIL. Carta do Brasil 1:500,000. 9 sheets *Rio de Janeiro: Conselho Nacional de Geografia*, 1945–47

FRENCH GUIANA. Esquisse Photogrammétrique de la Guyane Française 1:50,000. 5 sheets. *Paris: Institut Géographique National*, 1947

POLAR REGIONS

RÉGIONS ARCTIQUES. 1:3,028,000 à 65° N. 4 sheets. *Paris: Institut Géographique National*, 1948

SVALBARD TOPOGRAFISK KART. 1:100,000. Sheet B10, Van Mijenfjorden. *Oslo: Norsk Polarinstitutt*, 1948

FALKLAND ISLANDS DEPENDENCIES. 1/6M. *Teddington: Directorate of Colonial Surveys*, 1949

SOCIETY'S NEWS

MEDALS AND AWARDS 1949

His Majesty the King approved the award of the Royal Medals as follows: *The Founder's Medal* to Professor L. Dudley Stamp for his work in organizing and directing the Land Utilization Survey of Great Britain and his application of geography to national planning; *The Patron's Medal* to Professor Hans Pettersson of Sweden for his leadership of the recent oceanographical cruise in the *Albatross* in the course of which much new evidence has been obtained as to the geology of the ocean floor. The Council have awarded *The Murchison Grant* to Lieutenant-Colonel E. H. Thompson, O.B.E., R.E., for original researches in the techniques of Air Survey, and for the development of stereoplotting machines; *The Back Grant* to Dr. Brian Roberts for his contributions to polar history and to the technique of polar travel; *The Cuthbert Peek Grant* to Mr. A. B. Crawford, B.E.M., for surveys and meteorological work carried out by him at Tristan da Cunha and Marion Island; *The Gill Memorial* to Dr. O. H. K. Spate for his work on the geography of India and Burma.

GEOGRAPHICAL ESSAY PRIZE

This year the Council is again offering the Geographical Essay Prize of £10 for an essay of not more than five thousand words: either a critical survey of recent additions to knowledge in a limited geographical field, or a discussion of some current problem in its geographical aspects. Competitors must be registered students reading Geography at a University of Great Britain or Northern Ireland during the academic year in which they submit their essay. Contributions for this year's award must reach the Director and Secretary by 15 January 1950.

CONFERENCES ON CIVIL AVIATION AT THE SOCIETY'S HOUSE

Continuing the policy announced in the Presidential Address of 1947 (*Geogr. J.* 109 (1947) 162) of utilizing the Society's House to the maximum advantage of geography as a whole, three conferences were held here under the auspices of the International Civil Aviation Organization between March 14 and May 12.

The African Indian Ocean regional meeting was the last of a series convened since 1946 in various capitals to make regional recommendations for the safety and efficiency of civil aviation. Ten regions have been distinguished according to predominant types of flying operation; thus long-range ocean flights characterize the North Atlantic region and short-range overland flights the European–Mediterranean region. The African Indian Ocean region is one of unusual complexity and special problems in the provision of aerodromes, radio and meteorological facilities, and a search and rescue organization arise from the inaccessibility of the terrain.

The Special North Atlantic Meteorological Telecommunications meeting discussed plans for increasing the speed and efficiency of aviation weather services in that region and recommended central clearing points for weather data to be set up in Paris and New York.

The meeting on the Financing and Operation of Air Navigation services drew up a new international agreement for the maintenance of the weather

ships in the North Atlantic. The original agreement, which expires in 1950, provided for thirteen stations (*Geogr. J.* 109 (1946) 266), but resources in money and ships have imposed a limitation on the number and the new arrangement reduces it to ten. The meeting also dealt with the maintenance of the *Loran* station in the Faroes and the Ellenikon airport near Athens.

The three conferences required the employment of a large clerical staff, the greater part of which was also accommodated in the Society's House.

R.G.S. RESEARCH SERIES

The Society's *Research Series* has the special purpose of facilitating the publication of scientific memoirs on geographical subjects too long or too specialized for the *Geographical Journal*, the whole cost of publication being carried by the Society. Papers suitable for the Series should normally be the products of mature scholarship. Each memoir is not expected to exceed sixty-four printed pages (9½×7 inches) and allowance is made for a limited number of plates, maps and text figures.

Number 1 in the Series, published last year, is the study by the distinguished Swedish glaciologist Hans W:son Ahlmann, 'Glaciological research on the North Atlantic coasts,' a comprehensive summary of nearly thirty years' work on glaciers. An important result of Professor Ahlmann's work in this field is the confirmatory evidence it provides of the present climatic fluctuation, which he made the subject of a recent paper to the Society published in our last issue (*Geogr. J.* 112 (1948) 165–95). This monograph may be obtained from the Office of the Society; price 7*s.* 6*d.*, to Fellows, 6*s.*

THE RECORD

INTERNATIONAL GEOGRAPHICAL CONGRESS AT LISBON

The 16th International Geographical Congress was held in Lisbon between April 5 and 18. Eleven years had elapsed since the last congress met in Amsterdam, and the organizing committee and its energetic secretary, Professor Orlando Ribeiro, must be congratulated on their courage in undertaking the task after so long an interval. It was indeed intended that the meeting should take place in September of last year; the difficulties attending post-war travel led to its postponement then, but the committee renewed its invitation and had arranged a very full programme of communications, excursions and social engagements. The opening ceremony was held in the Palácio da Assembléia Nacional in the presence of the President of the Republic and the Cardinal Patriarch of Lisbon, and the various sections then applied themselves to their papers and discussions in the commodious lecture theatres of the Instituto Superior Tecnico. We intend to publish an account of the work of the sections in a later *Journal*. Section 1 (Cartography) was enriched by the exhibition of modern maps from many of the participating countries, and Dr. Willatts' smaller display of the series of distribution maps prepared at the Ministry of Town and Country Planning attracted much favourable comment.

At the general assembly of the International Geographical Union, held on the last day of the congress, new officers were appointed. Professor Emmanuel de Martonne on retiring from the Presidentship becomes Honorary President

of the Union for life, and is succeeded by Professor George B. Cressey of Syracuse University, U.S.A. The following new Vice-Presidents were elected: Mlle M. A. Lefèvre (Belgium), Orlando Ribeiro (Portugal), L. Dudley Stamp (Britain), Hans Boesch (Switzerland), C. Leite de Castro (Brazil), George Kuriyan (India). Professor G. H. T. Kimble of McGill University succeeds Mlle Lefèvre as General Secretary of the Union. New commissions were set up to work on the 1/M Map, World Land Use, Regional Planning, Periglacial Morphology, Soil Erosion, and Interpretation of Aerial Photographs.

Accepting the invitation extended by Professor Cressey, the Union resolved that the next congress should be held in the United States in 1952. The new President expressed a wish that a closer contact than had been possible in recent years should be maintained between the Union and the national committees of participating countries. The congress proper terminated with a ceremony at the house of the Geographical Society of Lisbon.

To all geographers who visit a new land the greatest pleasure must lie in their opportunity to see the country and its people, and the organizing committee had arranged an admirable series of excursions over Portugal as well as one to Madeira; conducted by Portuguese scholars and illustrated by carefully prepared guide books, they afforded a remarkable insight into a landscape quite unfamiliar to most of us. For those who could not afford the time for the longer tours there were interspersed among the sessions of the congress one-day excursions to Cintra and Arrabida, a cruise on the Tagus and a tour of Lisbon itself.

The congress was attended by about 600 members, mainly from western Europe, the middle East and the Americas; over thirty were from this country. Communications had also been received from eastern Europe, though the readers were absent. The congress produced, as always, many stimulating personal contacts and wherever we went we met with hospitality and kindness.

F. G.

PACIFIC SCIENCE CONGRESS, NEW ZEALAND, 1949

Dr. Kenneth B. Cumberland of Auckland University College sends us this account of the Seventh Pacific Science Congress held in Auckland and Christchurch from 2 to 22 February:

Never before had New Zealand experienced such an influx of eminent scientists as it did during February 1949, when more than two hundred authorities in their respective fields attended the sessions of the Seventh Pacific Science Congress in Auckland and Christchurch. The holding of the Congress in New Zealand and the success it attained did much to overcome the barriers of isolation which still affect the Dominion even in this Air Age. New Zealand scientists attending the sessions were as numerous as the visitors, and all derived great benefit from the contacts they made on both formal and informal occasions.

The Congress' deliberations were organized in nine divisions: Geology and Geophysics; Meteorology; Oceanography; Zoology; Botany; Soil Resources, Agriculture and Forestry; Anthropology; Public Health; and Social Sciences. Although there is no division for geography, matters geographical were discussed by geographers in almost all divisions; geographers from overseas attended the congress and presented reports of standing committees on which they serve; and New Zealand geographers took a prominent part in the organization of the Congress, the designing of symposia and the deliberations of divisions. New Zealand meteorologists provided the visitors with beautiful summer weather; volcanologists arranged for Ngauruhoe to display itself in violent eruptive mood; seismologists provided minor earthquakes, and zoologists rediscovered the presumed-extinct *takahe* (*Notornis hochstetterii*). The only

disappointment expressed by the visitors was that the moa had not been found for their further enlightenment.

In divisional and interdivisional sessions much important work was done. Reports of standing committees set up by earlier congresses were presented and discussed, research programmes for the Pacific area were formulated and hundreds of papers on all aspects of Pacific science were presented and read by scientists from twenty countries. From the geographer's point of view the highlights of the formal scientific sessions were the symposia on "Climatology of the Pacific region," "Landforms of tectonic origin in circum-pacific lands," "The protection of nature in the Pacific," "Problems of plant geography in the Pacific area," "Land classification in relation to land use," "The changing agricultural economy of the Pacific islands," "Administration and welfare among Pacific dependent people," "Economic and power resources of the Pacific area" and "Demographic problems of the Pacific." The geographers taking part in these discussions included President Emeritus Wallace W. Attwood of Clark University, Professor C. Skottsberg of Göteborg, Dr. C. E. Kellogg of the U.S.D.A. Division of Soil Survey, Professor A. K. Lobeck of Columbia University, Dr. Cushman Murphy representing the American Geographical Society and Professor C. A. Cotton of Wellington. In addition, papers were presented *in absentia* by Professor J. Wesley Coulter, University of Cincinnati, Professor R. E. Murphy, Clark University, Dr. K. J. Pelzer, Johns Hopkins University, and Dr. R. L. Pendleton, who is now in the Belgian Congo.

The research programme finally approved by the Congress as a result of the discussions and proposals of the several divisions reveals the need for contributions from geographers. In recommending the employment of teams of specialists in initial surveys of the island groups of the Pacific, on the pattern of the recent Co-ordinated Investigation of Micronesian Anthropology in the U.S. Trust Territories, the Congress recognized the place of geography and geographical techniques in area studies of this order, and the need for investigation of contemporary patterns of land use and agricultural economy and the relation of these to the physical and cultural resources of the islands.

The Eighth Pacific Science Congress is to be held in the Philippines.

LIVERPOOL MEETING OF THE GEOGRAPHICAL ASSOCIATION

The 1949 Spring Conference of the Geographical Association was held at Liverpool from April 19 to 23 and was organized by Mr. W. R. A. Ellis, the honorary secretary of the Liverpool and district branch. The Conference was housed in Derby Hall, the University hall of residence for men, and was attended by some 200 members. A good deal of time was naturally devoted to the central theme, the geography of Merseyside, and lectures on various aspects of the region were given by Mr. W. Smith and Mr. J. E. Allison. One evening was occupied by a Brains Trust on "The problems of Merseyside" at which various interests in the district were represented, with Professor W. Lyon Blease as question master.

A panoramic view of Merseyside from the top of the Royal Liver Building and a visit to the Cathedral introduced visitors to the city. The next morning a voyage along the estuary was made in a Mersey ferryboat under Captain E. H. McCormack. Later in the week there were two full-day excursions into the surrounding district. One, to south-west Lancashire, was concerned mainly with farming on diversified soils; while the alternative excursion to the Wirral peninsula visited, amongst other things, the market gardens at Leasowe, the marshes and glacial cliffs along the Dee, and the Eastham locks on the Man-

chester Ship Canal. On other days shorter visits were made to Port Sunlight, to the Birkenhead and Wallasey flour mills, to the Liverpool–Bootle dock estate and to the satellite town of Speke with its aerodrome, where a lecture on "The geography of an airport" was given by Mr. R. T. White. Other lectures were given on "The tides" by Dr. A. T. Doodson, Director of the Liverpool Observatory and Tidal Institute, and on "The changing content of geography in the nineteenth century" by Professor H. C. Darby. There was also an exhibition which included pictures of "Old Liverpool," models of the proposed replanning of the city, a set of "local studies" by Merseyside school children and a display by the Ordnance Survey of maps and instruments. Films and a locally produced film strip were shown at Derby Hall.

The social activities of the Conference included a reception by the Lord Mayor (Alderman W. T. Lancashire, J.P.) and the Lady Mayoress of Liverpool, and another by the Vice-Chancellor of the University (Dr. J. F. Mountford) and Mrs. Mountford. On the last evening a dinner was held, presided over by Sir Harry Lindsay, President of the Association as well as President of the R.G.S. Members attending the Conference were presented with copies of the 'Outline plan for the County Borough of Birkenhead' prepared by Sir Charles Reilly and Mr. N. J. Aslan, and 'The Mersey estuary' written by Mr. J. E. Allison and published by the University of Liverpool Press on the occasion of the Conference. H. C. D.

UNIVERSITY NEWS

UNIVERSITY OF OXFORD

The Oxford School of Geography celebrates the jubilee of its foundation during the course of the present term. A scheme for the provision of instruction in geography was published in the *Oxford University Gazette* of 25 April 1899. This scheme had been approved by the Royal Geographical Society; the committee then set up to supervise instruction in geography was originally composed of seven members three of whom were representatives of the Society: Sir Clements Markham, the Hon. G. C. Brodrick and General Sir Charles Wilson. In June 1899 the University Chest was authorized to fit up three rooms on the upper floor of the Old Ashmolean Museum to provide accommodation for the teaching of geography, and in the same month Mr. H. J. Mackinder (as he then was), the University's Reader in Geography, was appointed the first Director of the School and Dr. A. J. Herbertson as his assistant. Two part-time lecturers, Mr. H. N. Dickson on physical geography and Dr. G. B. Grundy on ancient geography, were appointed at the same time and the School opened in October 1899. Dr. Grundy, the last survivor of the original teaching staff, died on 6 December 1948. The *Journal* for July 1899 (vol. 14, pp. 82–3) recorded the establishment of the School in a short note emphasizing "the importance of this latest development in the efforts which the Society has been making for fifteen years to obtain adequate recognition of geography in the higher education of this country." At the end of the first fifty years of the School's existence it is right to recall the very large part played by the Royal Geographical Society in the foundation of the first British University School of Geography.

The last note on the Oxford School of Geography appeared in the *Journal* in 1947 (vol. 109, pp. 142–3) and there is much to record about the staff. The increase in the number of college lectureships in geography, as distinct from university appointments, recorded in detail below, is an important post-war development. Professor Kenneth Mason's lectures on the geography of international affairs are attracting large audiences. Mr. W. G. Kendrew, Dean of St. Catherine's Society and reader in climatology, was chairman of the

examiners of the Honour School of geography in 1948. Mr. J. N. L. Baker, fellow and bursar of Jesus College, has resigned his readership in historical geography but still continues to give some lectures in the School and to tutor Jesus men reading geography. Mr. E. W. Gilbert, lecturer in geography at Hertford College and reader in human geography, is now the corresponding member in Great Britain for the American Society for Professional Geographers; during the present term he is visiting lecturer in geography at Trinity College, Dublin. Mr. C. F. W. R. Gullick, lecturer in geography at Brasenose College and St. Edmund Hall, has recently been appointed senior lecturer in economic geography by the university. Mr. A. F. Martin, fellow of St. John's College and lecturer in geography at New College and Lincoln College, is librarian of the School and has been elected chairman of the examiners of the Honour School for 1949. Mr. R. W. Steel, university lecturer in colonial geography, is now the assistant secretary of the Institute of British Geographers. Miss M. Marshall, lecturer in geography at Lady Margaret Hall and departmental lecturer and map curator of the School, has leave of absence for two terms to undertake research in Cyprus with the support of the R.G.S. among other institutions. Mr. R. P. Beckinsale, Mr. E. Paget and Mr. J. M. Houston are all departmental lecturers. Mr. Beckinsale, who is also lecturer in geography at University College, has nearly completed his survey of the textile industry of the West of England. Mr. Paget has introduced some new courses of lectures on air photographs and Mr. Houston has paid two visits to Spain in connection with his research on Valencia. Miss H. F. Pickard-Cambridge is full-time assistant librarian and map curator and is preparing a card catalogue of the map collection. There are some twelve students registered as working for research degrees.

In the Easter vacation of 1947 a party of undergraduates, led by Mr. Paget and Mr. Martin, visited Ireland and carried out field work from Cork and Killarney. The excursion was organized by Mr. Paget, who received invaluable help from Mr. J. P. Haughton of Trinity College, Dublin, and Mr. C. S. O'Connell of University College, Cork. Mr. Martin led a field class to France in the Easter vacation of 1948 and was accompanied by Mr. Steel, Mr. Paget and Mr. Houston. In Strasbourg, M. Sittig and M. Juillard gave their services on excursions and M. Rol, M. Schneider and M. Savouret gave similar help in Nancy; the assistance of French geographers and historians added greatly to the value of the whole trip.

In Michaelmas term 1948 the Department of Social Anthropology moved into another building and vacated the rooms which it had occupied in the house in Mansfield Road. The School of Geography took over these rooms and is now in possession of the whole house; the additional space acquired had been badly needed for the rapidly expanding library and for other purposes. The newly equipped map-room in the New Bodleian has proved to be a great boon to geographers, and the assistant librarian in charge of the room, Mr. E. J. S. Parsons, has been made a member of the Faculty of Anthropology and Geography. He has given some lectures on foreign maps, illustrating them from the large collection in the Bodleian. E. W. G.

UNIVERSITY OF LIVERPOOL

The Department held its annual Field Week at Cowley Manor near Cheltenham from 14 to 21 April 1948. The week was organized by Dr. F. W. Mead and was attended by 50 undergraduates and members of staff. The following higher degrees were granted in June: PH.D., Julian Wu, "The rice economy of China"; M.A., H. R. Wilkinson, "Ethnographic maps of Macedonia." The

following post-graduate awards have been made: University Fellowship, I. B. Terrett; University Studentship, R. Lawton. All members of the Department are indebted for lectures by Mr. J. N. L. Baker of Oxford and Professor W. Fitzgerald of Manchester. The building in which the Department is housed has benefited from structural alterations which have provided an additional map laboratory and which have in other ways facilitated the working of the Department. H. C. D.

GRANTS FOR WORK IN THE NORTH AMERICAN ARCTIC

The Arctic Institute of North America is again offering a number of grants-in-aid for scientific work in the North American Arctic and Subarctic during 1950. The grants are open to anyone who has demonstrated his ability to carry out research work of superior quality in some field of science. Applicants must submit a specific programme of research to include field investigations either in Alaska, northern Canada, Labrador, Newfoundland or Greenland. Applications must be received by 1 November 1949 and the awards will be announced by March 1950. Application forms may be obtained upon request to The Arctic Institute of North America, 3485 University Street, Montreal, Canada; or Audubon Terrace, Broadway and 156th Street, New York 32, New York, U.S.A.

AIR PHOTO MOSAICS

The Ordnance Survey is now publishing air photo mosaics at scales of 6 inches to 1 mile and 1/1250 (about 50 inches to 1 mile), on the same sheet lines as the new National Grid maps and plans on these scales. The mosaics have been compiled from air photos laid down to give the best possible fit with ground control and errors in scale are very small. The 6-inch mosaics each represent an area of 5 kilometres, or about 3 miles, square (price 10*s*); the 1/1250 mosaics represent 500 metres, or about 545 yards, square (price 7*s* 6*d*) and are confined to built-up areas. The areas covered so far are mainly in the south of England. Inquiries as to whether mosaics of particular areas have been published should be addressed to the Director-General, Ordnance Survey, Chessington, Surrey.

A RUSSIAN REPRINT OF BELLINGSHAUSEN'S JOURNALS

According to the *Soviet News* (15 March 1949) there is soon to be a new edition of Captain Bellingshausen's account of his remarkable voyage to the Antarctic in 1819–21 during which he was the first to discover land within the Antarctic Circle. It is edited by Rear-Admiral Eugeni Shvede, and includes some previously unpublished documents besides modern commentaries and notes. The account originally remained unpublished for ten years after the expedition's return, which may partly account for the lack of contemporary interest in Bellingshausen's achievement. The first full English translation (that of Professor Edward Bullough) appeared as recently as 1945, edited by Professor Frank Debenham, and published by the Hakluyt Society (2nd ser., vols. 91–2). It was reviewed at length in this *Journal* (110 (1947) 100–2) by the late R. T. Gould.

REINDEER FARMING IN THE U.S.S.R.

Reindeer farming is, and has for long been, the main occupation of the inhabitants of a very large part of the north of the U.S.S.R. The industry (for want of a better word) is developed in Karelia, Kol'ski Poluostrov (Kola peninsula), the Pechora basin, Yamal, Yakutia, on the Kolyma, along the shore

of the Okhotsk Sea and in Chukotka; in fact, in a large part of the tundra and *taiga* lands. Reindeer provide the only means of transport in many districts particularly in the forest. They also provide the northern peoples with meat, hide for making clothes, travelling equipment and tents, antlers for tools, hair for stuffing and several other useful commodities.

It is difficult to obtain reliable figures for the number of reindeer in the U.S.S.R. Soviet estimates of the 1920's were in the region of 2,000,000. For 1933, the year that the collectivization of reindeer herds was introduced, the *Soviet Encyclopedia* quotes about 1,500,000. Soviet statistics (expressed in percentages) show that after that date the herds grew steadily up to 1941, when they had increased by a third since 1933. During the war years the numbers dropped, but in 1946 they rallied and were said nearly to have reached the 1939 level. Many herds were brought into collective and state farms after 1933, and by 1946 these herds had increased ninefold while the total reindeer population had increased by less than a third. It is clear that even if these figures are not entirely reliable, the reindeer industry in the U.S.S.R. is of considerable dimensions.

A book which has recently been published provides much information on the technique of reindeer farming in the light of recent experience. ('Severnoye Olenevodstvo' or 'The northern reindeer industry,' edited by P. S. Zhigunov and F. A. Terent'yev. Moscow: State Publishing House of Agricultural Literature, 1948; illustrated; price 9 R. 30 kop.) The information is set out in as simple and comprehensible terms as the subject will allow, and the book is presumably intended to be a handbook and guide for those who are to be trained as reindeer herdsmen in conformity with the Government's intention to expand and develop the northern reindeer industry. There is however a good deal of technical phraseology which seems to have been used in order to impress the reader with the scientific approach.

Much space is devoted to problems of health, for disease has always been a principal obstacle to development of reindeer farming in Russia. After an introduction on the animal's anatomy and physiology, which are explained in elementary terms in some detail, there is a chapter on hygiene. The effects of heat, cold, insects and dust are explained with the recommended action to counteract them. Malignant anthrax which has frequently ravaged herds can now be prevented by inoculation. Necrobacillus or "hoof disease," another widespread complaint, can be treated medically with some success, but no method of immunization has yet been found. A number of other infectious diseases are explained and the treatment indicated. Instruction for herdsmen on first-aid for wounds and broken bones is also supplied.

Herd management receives detailed attention. Types of pastureland are analysed botanically and their effect on reindeer made clear. The rate at which pasture is exhausted by a herd of given size is calculated. There is some very practical information on corralling and the layout of slaughtering points and of halting points on a herd's track from one pasture to another. There is an interesting chapter on the reindeer as a means of transport. Plans and sketches of the types of harness are shown, both for sledge drawing and pack carrying. The other principal economic uses of the animal—the dressing of meat and hides—are also considered.

It is rather surprising, in so detailed a work, to find no reference to the considerable literature published in Scandinavia and in Alaska and Canada on methods of reindeer breeding. Unfortunately there is also no bibliography.

This is a predominantly practical book. The experience of herdsmen in many parts of the U.S.S.R. has clearly been tapped. But there is no doubt that

the accumulation of detailed knowledge which makes possible the compilation of such a book is the result not only of study of the methods used by the northern peoples but also of the very considerable scientific effort which has been expended on the subject during the last fifteen years or more. An Institute of the Reindeer Industry was founded in 1931 and still exists though it is now incorporated in another institute. A journal dealing solely with the reindeer industry and chiefly with its zoological and botanical aspects has been appearing since 1933. A Chair of reindeer breeding is to be established in 1949 at the Leningrad Agricultural Institute. The Soviet Government in fact takes the industry seriously because it has been economically useful in the past and can no doubt become still more so in the future. TERENCE ARMSTRONG

GREENLAND AND CONTINENTAL DRIFT: AN ARCTIC FIELD PROGRAMME

Professor C. E. Wegmann, in a publication entitled "Geological tests of the hypothesis of continental drift in the arctic regions, scientific planning" (De Danske Ekspeditioner til Østgrønland 1926–39, App. No. 7, *Medd. om Grønland* 144 (1948) 1–48, 2 maps), addresses those young men who, at the end of their scientific training, "still retain their enthusiasm and desire to start work in polar regions." The bait he dangles before them is a possible geological solution of the hypothesis of continental drift, at least as far as the relationship between Greenland and north-west Europe is concerned. The regions involved range from Spitsbergen, through Peary Land in north Greenland, to Grant Land. These are the land masses which lie north of the Greenland or Scandic Sea and south of the Polar Basin.

After an excellent but brief survey of the continental drift hypothesis, its history, and the various ways in which it has been attacked, the author considers the geometry of the assumed drift movements. These are divided into parallel, rotational or combined displacements (p. 17). The first of these he subdivides into those movements which result in a gap being formed between two fracture planes, a drifting apart; and into lateral movements along one fracture plane—the type of slip encountered on a tear-fault. Such a plane of horizontal slip may possibly occur along the line running from Vesteraalen in Norway, south of Bear Island and Spitsbergen along the north edge of the Greenland or Scandic Sea basin, and thence continuing parallel to the north coast of Greenland to beyond Grant Land, thus forming the southern edge of the Polar Basin. This line is termed the De Geer Line by Wegmann after the author who first recognized its peculiar relationship to the two seas (G. de Geer, *Ymer*, 46 (1926) 133–45). It "is regarded by Taylor and Du Toit as a possible line of displacement, along which the land masses have drifted" (p. 21). The two maps accompanying the paper have been drawn on Mercator's projection with the De Geer Line as an equator, and in this way its significance has been emphasized.

Wegmann considers that if there has been drift along the De Geer Line it should be possible to obtain some geological relationship between the rocks on the north side of the line with those on the south side; that is, between Spitsbergen on the one hand and Greenland or Grant Land on the other. It is suggested that the Mesozoic and Tertiary sediments of Spitsbergen might provide the link. The material of which these are formed was derived from some land mass lying to the west of the islands; a region which has either sunk beneath the sea or has drifted away. If the latter has occurred, the rocks from which the sediments of Spitsbergen were derived should be preserved in Peary Land or Grant Land. The investigation necessary would be extensive, requiring several teams working in different districts but all cooperating together.

Two programmes for research are outlined in the article. The first is designed for one field season; the second, which is more comprehensive, includes wintering in the regions under investigation. The two programmes are however supplementary; the short one should yield results of value, but the longer one would be expected to give much more information because tectonic and stratigraphical investigations could be undertaken in key areas located during the first year. The problem is dominantly geological, but further knowledge of the submarine morphology is also badly needed. Exploration of the sea floor in the neighbourhood of the De Geer Line by echo-sounding, etc., is also suggested.

In the last twelve pages of the article Professor Wegmann considers the results of such exploration under two categories. First, that the two provinces—Spitsbergen and north Greenland—do correspond; and secondly, that they do not. In either case the discoveries would add greatly to our knowledge of little known regions, and they might "have far reaching consequences of a fundamental character. The results will be of importance far beyond the Arctic region, both in the American and in the Eurasiatic sector" (p. 43).

GILBERT WILSON

THE COURSE OF THE YELLOW RIVER

In June 1938 the south main dyke of the Yellow River was cut at Huayuankou to impede the advance of the Japanese. Its flood waters then meandered in a broad belt south-eastwards across the intensively cultivated delta to join the Hwai river west of Pengpu. Six million refugees, farmers and their families, were compelled to flee westwards, abandoning two million acres of good farmland. Mr. O. J. Todd, who was chief adviser to the Yellow River Commission, describes in the *Geographical Review* for January 1949 the work of filling the five-thousand-foot breach. With much assistance in materials and equipment from U.N.R.R.A., this was accomplished between early 1946 and March 1947, when the river resumed its earlier course north-eastwards to the Gulf of Chili, which it had maintained since 1852. Mass ploughing by tractors enabled returning farmers to plant crops at once. Mr. Todd outlines the main characteristics of the river's regime and the works necessary to control it adequately in future.

SEDIMENTATION IN STILL WATER

In *Verhandelingen du Koninklijke Nederlandsche Akademie van Wetenschappen, afd. Natuurkunde,* vol. 45, no. 3, 1948, Dr. A. Reijne discusses the rate of sedimentation, mainly of an organic nature, in pools formed in the first place by the bursting of embankments. This he claims as a unique investigation. He has historical records of twelve of these pools, and has been able to measure the amount of sedimentation since they were formed. The earliest dates back to 1543; several were formed in 1717 and some earlier. The bottom of all consists of hard sand. They vary much in size ($^1/_6$ to $2^1/_2$ acres; one contains 10 acres) but far less in depth. The rate of sedimentation varies: in seven of the pools an average of 23·4 mm. a year occurs, in others the rate falls to 16·4 mm. or less. "The organic mud in these pools is almost wholly formed by plankton. . . . A small amount of sand or clay is found in this mud; it has been washed from out the walls of the pool, especially during the beginning stage of sedimentation. . . ." This black organic mud generally smells of sulphuretted hydrogen, and the colour results from minute particles of ferric sulphide and pyrite. It shrinks considerably on drying. Little is known of the original components of the mud.

J. A. STEERS

H. W. BATES: A CENTENARY

Mr. Carl Pape of Slough Technical School points out that the frontispiece to H. W. Bates' 'The naturalist on the river Amazons,' entitled "Adventure with Curl-crested Toucans," was drawn by Joseph Wolf and not by J. W. Whymper, the engraver, as stated in this *Journal* (112 (1948) facing p. 2) when the picture was reproduced to mark the centenary of Bates' departure for the Amazons. (A. H. Palmer, 'The life of Joseph Wolf,' p. 317, 1895.)

THE PRESENT CLIMATIC FLUCTUATION: CORRECTIONS

Two errors have been brought to our notice in Professor Ahlmann's paper in our last issue (*Geogr. J.* 112 (1948) 165–95). At p. 177, footnote 1, "World Weather, 6" should read "World Weather, 5." At p. 191, line 5, the figure 0·73 m. should read 0·43 m.

OBITUARY

EDWARD HEAWOOD

Librarian R.G.S. 1901–33; Librarian Emeritus 1934–49

Edward Heawood, Librarian of the Society for over thirty years, died at his home at Merstham on April 30 in his eighty-fifth year. During the course of a long and valuable career he contributed greatly to geographical science, a field for which his wide intellectual background in both humanistic and scientific studies especially fitted him.

In his youth he had been fascinated by the narratives of the great explorers, particularly in Africa, and early resolved to equip himself for travel or a career in geography. After taking his degree in classics at Cambridge, he became a Fellow of the Society in 1886 and took courses in surveying, geology and botany. H. W. Bates, then Assistant Secretary, advised him to acquire experience in the field, and he accordingly went out to India with the intention of proceeding to East Africa. In India however he was asked to take part in a scheme for settling Santals in the Bengal Duars, where he worked for two years, pursuing in the intervals from hard work his interest in natural history. On his return, he joined the staff of the Society in 1894, working in the Library and assisting with the *Geographical Journal*, to which he had already begun to contribute notes. He prided himself that until his retirement in 1934, he had contributed to every monthly issue. He also assisted Dr. Hugh Robert Mill in his bathymetrical surveys of the English Lakes, undertaken by direction of the Council. Heawood maintained his interest in African affairs, keeping abreast of the extensive literature then appearing, and in 1896 wrote a textbook for Macmillan on African geography, treated on a regional basis. His last work on this subject was the valuable chapter on African exploration, 1783–1870, in volume 2 of the 'Cambridge history of the British Empire,' 1940.

In 1901 he was appointed Librarian in succession to Dr. Mill. As Librarian, particularly in the early years, when prices were lower, he did much to extend the Society's collection of early geographical works and atlases, and also gave special attention to building up the Library's holding of foreign geographical publications. Continuing his study of the history of exploration, he published in 1912 an excellent survey of the work accomplished in the seventeenth and

eighteenth centuries, a period previously somewhat neglected, and this, accompanied by maps which he drew for reproduction himself, remains the best guide to this subject. His work in this direction led naturally to the investigation of early map sources, and he came to concentrate increasingly on the history of cartography. The results of his work are contained in many papers and reviews in the *Geographical Journal* and in the two special publications, "The map of the World on Mercator's projection by Jodocus Hondius, 1608" (1927) and "English County maps in the collection of the R.G.S." (1932). These were distinguished by the combination of careful attention to the details of cartographic style and engraving, extensive knowledge of the general history of geographical thought, a sound mathematical background and appreciation of the work of other students. At all times he was very ready to encourage and help those who sought his advice.

In solving problems connected with the dating of early maps, he was led to make a detailed study of water marks used by English and continental paper makers and the distribution of the various kinds of paper. This became the principal occupation of his later years. His first essay was published in the *Journal* for May 1924, and later results appeared in the *Transactions* of the Bibliographical Society in 1930, 1931 and 1948. These papers were accompanied by hundreds of tracings of marks collected from many and varied sources. On the day of his death he had been working on an index to a comprehensive selection to be published in Holland.

In 1933 he received the Research Medal of the Royal Scottish Geographical Society, and the following year, on his retirement, the Society's Victoria Medal, the Council further marking their appreciation by conferring on him the title of Librarian Emeritus.

With his predilection for the history of exploration, it was natural that he should be a staunch supporter of the Hakluyt Society. Though he never edited a work for it, his advice was invaluable to many editors, and he gave distinguished service as Treasurer from 1908 to 1946, and latterly as Vice-President. He was also Recorder of Section E of the British Association for a period, and for many years secretary of the Kosmos Dining Club.

With a somewhat retiring disposition, Heawood combined strongly held opinions, and when the necessity arose would take a strong line. He disliked town life—having scarcely spent a night in London for forty years—and was happiest in his Merstham garden or visiting the English countryside, which he knew intimately. He formed many lasting friendships, and as a colleague was considerate and sympathetic.

G. R. CRONE

CORRESPONDENCE

THE RELATION OF GEOMORPHOLOGY TO GEOGRAPHY

With reference to the letters from Professor S. W. Wooldridge and Professor David L. Linton on "The relation of geomorphology to geography," which appeared in the *Geographical Journal* (112 (1948) 125–7) published in January 1949, the following pronouncement on geography considered as a branch of education may be of interest. It was issued by a committee of the International Geographical Congress at Geneva in 1908, was signed by Flahault, Ricchieri, W. M. Davis, de Claparède, Brunhes, Chodat, Brückner, Penck and others, and ran as follows:

> "La géographie, en tant que branche d'enseignement, a pour objet la description de la surface de la Terre, considérée dans les éléments divers, physiques et vivants, dont la combinaison et l'enchaînement déterminent la physionomie actuelle du globe. Cet enseignement dans l'instruction primaire et secondaire doit être fondé sur la lecture des cartes et suivre surtout la méthode synthétique. Dans le tableau qu'elle trace des différentes parties du globe, la géographie doit tendre en première ligne à mettre en évidence les relations entre le monde inorganique et les êtres vivants, et plus particulièrement entre la surface de la Terre et l'homme." C. F. ARDEN-CLOSE

7 *April* 1949

THE SOCIAL DEVELOPMENT OF MODERN EGYPT

I have read with interest Mr. Hillelson's review of Mr. Charles Issawi's book on Egypt (*Geogr. J.* 112 (1948) 91–2). I had already read Mr. Issawi's book and found in it many points worthy of comment, even of rectification, but had declined to do so until they were given greater publicity by being reviewed in your *Journal*.

One is led to the conclusion that the author did not have before him the latest data when writing his book. For example, it is stated that the budget of the Ministry of Education had risen from £E525,000 in 1914 to £E4,438,000 in 1939. Noting that Mr. Issawi's book was published only in 1947, it is really to be regretted that it does not contain the latest possible information, especially when so much progress had been achieved in our country in the last few years. This year (1949–50) the budget of the Ministry of Education—excluding the three universities—amounts to £E19,792,047. As to the number of pupils of all grades, reported by the author to be 232,000 in 1939; it is now far superior. Indeed this year (1949) there are 202,626 pupils in the "Kindergarten" and Government elementary schools only, not to mention the similar non-government institutions and the other grades of education: primary schools, secondary schools, technical institutions, Higher schools and the three universities.

Likewise, Mr. Issawi's statement as to the material inequality between the richer and the poorer classes of the population is greatly exaggerated. I am not implying that inequalities do not exist, but I should prefer the picture given to be a faithful representation of the facts. Sincere efforts however are being made towards real progress in this respect. I will mention here that the new Progressive Taxation Act, recently voted by the Parliament and soon to

be put into execution, establishes a progressive tax on the entire income amounting to 50 per cent. for incomes of £E100,000 and more per annum.

These are some, and only some, of the points in Mr. Issawi's book that I felt worthy of comment.

GAMAL BADR

Alexandria, 10 *April* 1949

MAPPING NEW ZEALAND'S AGRICULTURE

I have read with great interest Dr. Cumberland's excellent and informative paper on "The agricultural regions of New Zealand" which appeared in the last issue of the *Geographical Journal* (112 (1948) 43–63). I wish to compliment Dr. Cumberland on the thoroughness of the study and the maps accompanying it, but I cannot accept his claim to priority in the publication of dot-distribution maps of the Dominion. I included dot maps of wheat, turnips, dairy cows and sheep in the chapter on New Zealand of my 'Australian climates and resources,' published in Melbourne at the end of 1946. But I am pleased to state that Dr. Cumberland's maps represent a great improvement on my own.

J. GENTILLI

3 *March* 1949

MEETINGS: SESSION 1948–49

Christmas Meetings. 29 December 1948: Exploring Britain's islands. By James Fisher and Ludwig Koch. 3 January 1949: Bush Christmas. A sound film

Ninth Meeting, 10 January 1949. A joint meeting with the Institute of Navigation

Films: How radar is used in navigation. Sound films with introduction by R. F. Hansford

Tenth Meeting, 17 January 1949. The President in the Chair

Elections to Fellowship: Dr. David U. Bedbrook; Major Christopher A. Biddle, R.E.; Mrs. Annie I. Butler; Miss Shirley Carpenter, M.A.; Eric W. S. Dodge, B.A.; George Stewart Fraser; Cyril F. W. Futcher; Marcus Campbell Goodall; Miss Florence R. Gregory, B.A.; Albert William Gregory; Arthur Cudworth Hall; Caleb D. Hammond, Jnr.; Frederick O. Isaac; George Albert H. Johnson, M.SC.; Kenneth Charles Jordan; Joel Foster Kell; Captain Herbert Lovegrove, R.N.; Lieutenant Commander Thomas Keith Metcalfe, R.N.R.; Miss Margaret M. Moncreiff; Joseph R. B. Motha, B.COM.; Lieutenant Commander Henry E. Offord, R.N.V.R.; Captain Lewis Parfitt, D.S.C.; Mrs. Daisy F. Pidcock; Mrs. A. M. Reynolds; John Hargreaves Robinson, B.A.; Otto William Samson; Brian Lindsay Strange; Donald Alec E. Taylour; Mrs. Dorothy E. Towers; John Carrick Trevor, M.A., B.SC.; Leonard F. P. Trueman; Alan Douglas Tweedie, B.A.; Miss Eleanor C. Vollans; Anthony Thomas Walsh; Richard W. T. Whittington, B.A., Dip. Ed.; Chike Adophy; Peter Maurice Pineger

Transferred from Associate Membership: Miss Marie Keighley Beard; Miss Margaret Joy Theaker; Miss E. Mary Thomas

Elections to Associate Membership: John Lewis Glasscock; Miss Thelma E. M. Granger; Miss Jean Norris Landalls; Godfrey Edward Murt

Paper: The Oxford expedition to Gambia Colony. By Francis Huxley

Eleventh Meeting, 24 January 1949. Professor S. W. Wooldridge in the Chair

Paper: Air mass meteorology—its geographical implications. By Professor C. G. Rossby

Twelfth Meeting, 7 February 1949. Mr. Leonard Brooks, Honorary Secretary, in the Chair

Paper and films: The life of the Tristan islanders. By A. B. Crawford

18 February 1949. A meeting of the Institute of Navigation

Papers: Operational aspects of marine radar. A symposium

Thirteenth Meeting, 21 February 1949. The President in the Chair

Elections to Fellowship: Eric D. Beaumont; Miss E. M. V. Berry; Captain G. R. Carew; Joseph J. Cheal; Mrs. M. Dodds, B.A.; Jack C. Hayes; Gordon Hepburn, B.A.SC.; Horace S. Hodges, B.SC.; Stanley R. R. Hood; Major H. F. Hutley; Harold R. Jarrett, M.SC.; Reverend Andrew Kennedy; A. B. H. Lamplugh; Edward V. Lane, M.A.; Lieutenant Arthur J. Lee, R.N.V.R.; Mrs. Phyllis M. Liell; Charles P. McLaughlan; Wilfred W. Marshall, B.A.; Edward W. Mellor; R. B. M. Muirhead; J. Ovington; Miss J. G. Plant; Herbert Rainer; D. A. R. Reid; John B. Rigg, B.A.; Dr. I. M. Rodriquez; Miss B. M. G. Rowe; Joseph Sanseverino; Arnold U. Sarpy; Mrs. Alma Scatliff; George J. Snowball, B.SC.; Alan Thomas; D. A. Tookey, B.A.; C. E. T. Roberts; Harry Vickers, B.A.; L. R. Watts; F. J. W. Whalley; James H. Williams, O.B.E.; Miss M. S. Williamson; Reginald H. Willis; Reverend Professor W. Rees-Wright, PH.D., M.SC., F.R.A.S.; Reverend E. W. Zinger; Luang Pramodya Charyavibhaj; Malcolm C. Davis

Transferred from Associate Membership: R. J. N. Sidney-Woollett

Elections to Associate Membership: James Franklin Acton; Miss Betty J. M. Cheetham; Miss Hilda Mary M. Cox; Luc Maurice Fanchette; E. F. Grimwood; Miss Valerie A. Harding; Francis David Hartley; John Desmond Hicks; Giles Christopher Johnson; Patrick Howard Kenney; Miss June Elizabeth Padfield; Ralph Willison Simmonds; Miss Audrey Toplis

Paper: Exploring the ocean bed. By Professor Hans Pettersson

Fourteenth Meeting, 7 March 1949

Films: Explorations in western Mexico. Kodachrome films with commentary by Dr. Telford H. Work

Fifteenth Meeting, 14 March 1949. Dr. Edward Lynam in the Chair

Paper: Some medieval theories about the Nile basin. By O. G. S. Crawford

18 March 1949. A meeting of the Institute of Navigation

Paper: The use of radar beacons. By K. A. B. Gilgillan

Sixteenth Meeting, 21 March 1949. The President in the Chair

Elections to Fellowship: Captain W. G. L. Allan, R.A.M.C.; Joseph H. Barratt; Mrs. E. M. Bousfield; Miss Audrey Campbell; Dr. Homi A. Choksey, M.B., B.S.; Robert Collins; Richard M. Cooper; Mrs. K. B. Daniell, B.A.; Mrs. E. M. Darlington, B.A.; C. E. Eadon-Clarke; James Fox; Miss D. V. Green; G. C. L. Hadden, B.A.; Harold R. W. Halliwell; Reverend Frederick Hart; Captain G. J. F. Holden, R.E.; G. E. Holland; Miss Pamela M. Jacobson; George N. Jones, O.B.E.; Reverend Glee E. Lockwood; Miss Elinor R. MacHatton;

P. A. Mann; Lieutenant-Commander C. Marshall, R.D., R.N.R., A.I.N.A.; Colin Ware Mitchell; Kenneth C. Moss; Mrs. Mabel Nandris, B.A.; John F. Oldfield; Gordon V. Rees; John Ruskin; M. S. Sealy; Miss Valerie M. Smith; C. Ernest Tatham; James F. A. Taylor; Captain Hugh L. Thomas; Vincent Ungaro; A. R. Wigram

Transferred from Associate Membership: Second Lieutenant C. Bell; Miss Jacqueline H. Jones

Elections to Associate Membership: John Philip Attree; Miss Diane Bailey; Miss Judith Buchanan; Kenneth J. Green; Miss Margaret I. Smith; Miss Audrey Wolff

Paper: Travels in Sinkiang. By Eric Shipton

Seventeenth Meeting, 11 April 1949

Films: North-west Iran today. Kodachrome films with commentary by Sir Clarmont Skrine

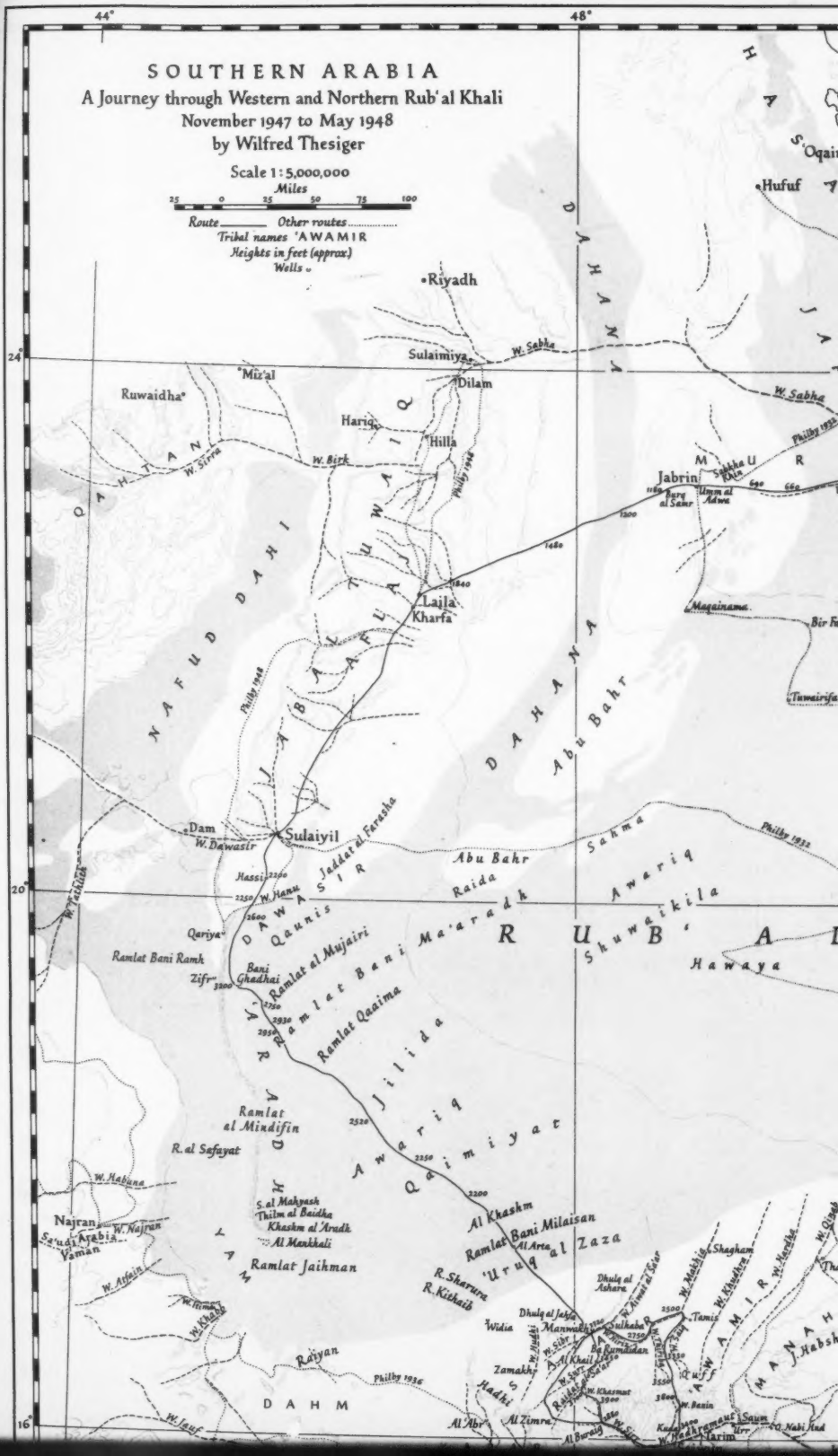
Eighteenth Meeting, 25 April 1949. The President in the Chair

Elections to Fellowship: Dermot F. Barton; Thomas P. Barington; Charles J. E. Betty; Basil R. Clarke; Eric W. Copeland; Miss Monica E. Craig; Gordon R. Cross; Hugh Leslie Dring; J. A. Gerber; Wilfred J. Goddard; Lieutenant-Commander C. Grice-Hutchinson, D.S.C., R.N.; Miss Phyllis Henley; H. F. J. Humphries; Eric H. H. Jones; Arthur R. H. Kellas; Frederick P. G. Kershaw; Reginald Ewart Lawry; Lieutenant Alfred D. Margrett; Lieutenant-Colonel B. G. Mason; J. McEwen Mason; Charles I. M. O'Brien; Moelwyn J. Rowlands; Harold B. Scott; V. A. Steggall, M.A.; Captain Ralph Sutton; Dr. Edwin J. Tharp; Major E. O'D. Thomas; Edward P. Torrey; Reverend H. Womersley; David Herbert Wood; Dr. Telford H. Work

Election to Associate Membership: Donald Schofield

Paper: China's prospects. By Professor George B. Cressey

Published June 1949


SOUTHERN ARABIA
A Journey through Western and Northern Rub' al Khali
November 1947 to May 1948
by Wilfred Thesiger
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JAFURA
DAHANA
Jabrin
Umm al Adwa
Lajla
Kharfa
Magainama
Abu Bakr
Dam
W. Dawasir
Sulaiyil
Jeddat al Faresha
Abu Bahr
Raida
Awariq
Shuwaikila
Hawaya
RUB' AL KHALI
Qariya
Ramlat Bani Ramh
Zifr
Bani Ghadhai
Ramlat al Mujairi
Ramlat Bani Ma'arad
Ramlat Qaaima
Jilida
Awariq
Qa'imiyat
Ramlat al Mindifin
R. al Safayat
W. Habuna
Najran
Sa'udi Arabia
Yaman
W. Najran
W. Asfain
W. Khalid
Ramlat Jaihman
S. al Makyash
Thilm al Baidha
Khashm al Arudk
Al Mankhali
Al Khashm
Ramlat Bani Milaisan
Al Arta
al Zaza
'Uruq
R. Sharura
R. Kithaib
Dhulq al Ashara
Dhulq al Jafra
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Sulhaba
Widia
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AMIR
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Zamakhshari
Hadhi
Raidat al Ghafar
W. Khasmat
W. Benin
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W. Jauf
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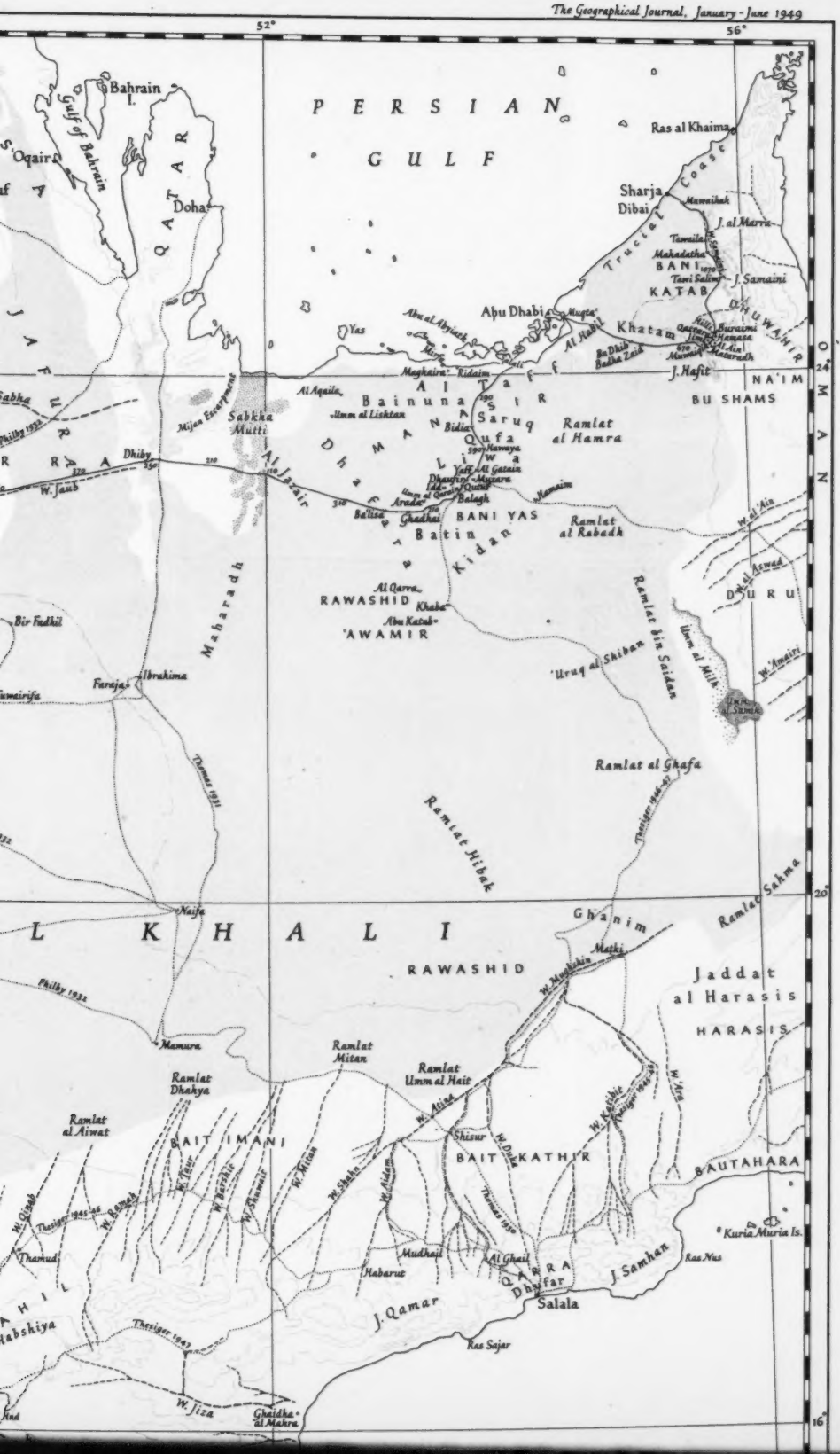
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Gulf of Bahrain
S'Oqair
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Trucial Coast
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J. al Marra
Tamila
Makadatha
BANI KATAB
Tami Salim
J. Samaini
Abu Dhabi
Mugta'
Yas
Abu al Abyiadh
Al Kabil
Khatam
Hill
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Al Aia
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Ba Dhib
Badha Zaid
DHU WAHIR
OMAN
Maghaira
Ridaim
J. Hafit
NA'IM
BU SHAMS
Al Aqaila
Umm al Lishtan
Bainuna
Saruq
Ramlat al Hamra
Sabkha Mutti
Mijen Escarpment
Dhiby
W. Jaub
Al Jazair
Dhafra
Liwa
Qufa
Naweya
Yafi
Al Gatain
Dhaufra
Muzara
Qutra
Balegh
Mamain
Aradat
Ballisa
Ghadhai
BANI YAS
Batin
Kidan
Ramlat al Rabadh
W. al 'Ain
Dhafra
Aswad
DHURU
Al Qarra
RAWASHID
Khabe
Abu Katab
'AWAMIR
Ramlat bin Saidan
Umm al Milh
W. 'Ameiri
Bir Fadhil
Maharadh
Farajan
Ibrahima
'Uruq al Shiban
Ramlat al Ghafa
Ramlat Hibak
Naifa
KHALI
Ghanim
Matki
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Ramlat Sahma
Jaddat al Harasis
HARASIS
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Ramlat Dhakya
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Al Ghail
Habarut
QARA
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Ras Nus
J. Samhan
Salala
J. Qamar
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W. Jiza
Ghaidha
al Mahra
Thesiger 1945-46
Thesiger 1947
Thesiger 1946-47
Thomas 1931
Thomas 1930
W. Ghab
W. Bahah
W. Ayoun
W. Mitan
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W. Kathir
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Thamud
Qabshiya
24°
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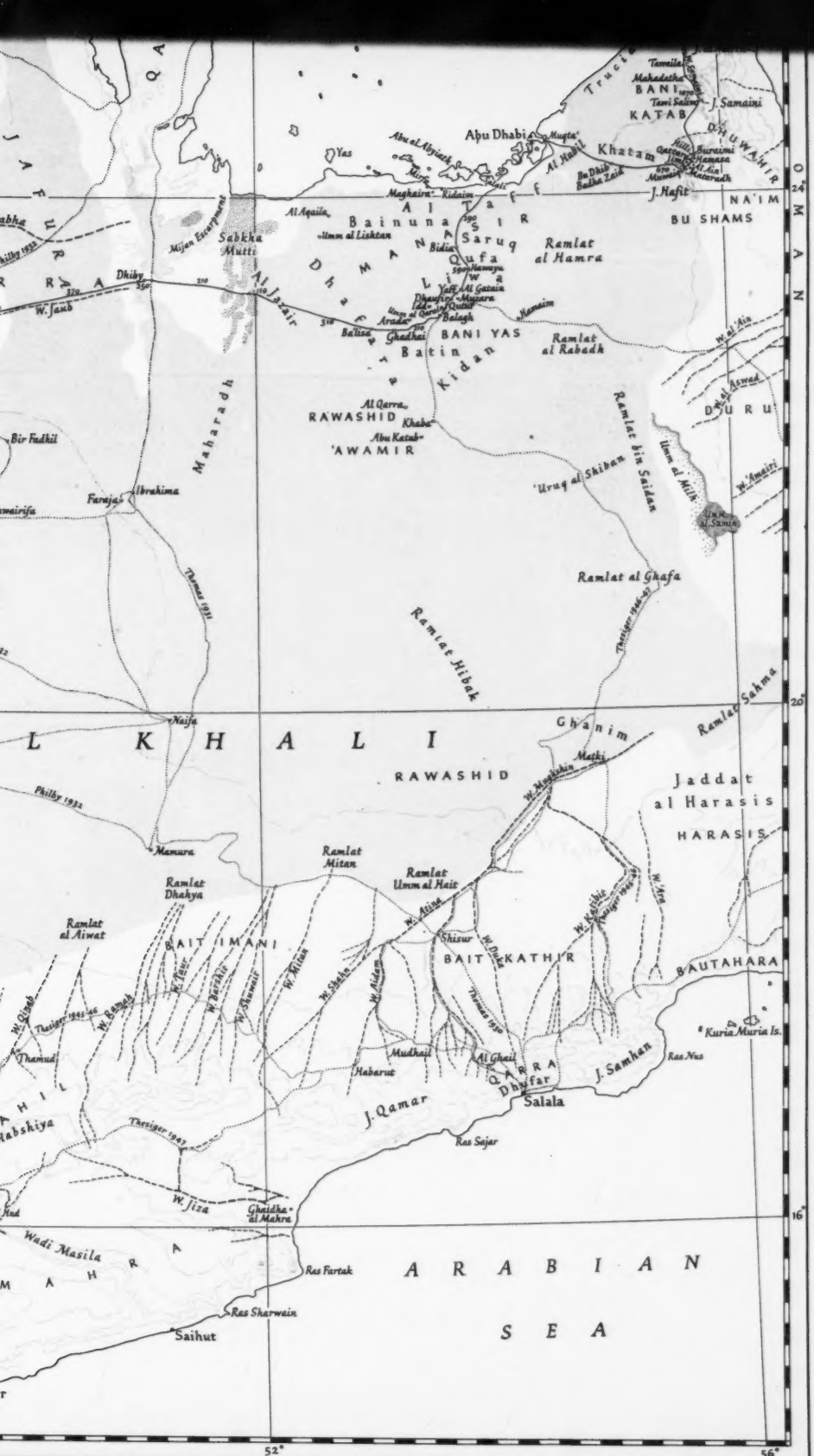

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SOUTHERN ARABIA
Thesiger